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New York:
JOSEPH H. LADD, PUBLISHER, No. 88 WHITE STREET.
LONDON: TRÜBNER & CO.

1865.

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INTRODUCTION.

The peculiar advantages of Dry Plate Photography are but little understood by the ordinary photographic operator; and, when these advantages are understood and recognized, there is a difficulty in withdrawing the artist from the general routine of the wet process, whose results are so easily and quickly obtained, flash out as it were in a moment for adoption or condemnation, to bestow his attention on a process whose results are invisible, and depend entirely upon the educated experience of the workman and the accuracy of his workmanship,—a structure, in fine, built upon *faith*.

There is a striking analogy between the two processes, wet and dry, and the two modes of printing, direct solar printing and printing by development. In solar printing albumen on paper, beneath a negative, the image appears gradually, and finally assumes all the necessary vigor; the operation of printing can be watched, controlled, and pronounced finished when the eye is satisfied. With a small quantity of experience *the eye becomes the sole guide.* But with development-printing the image is invisible; none of our senses can perceive its existence; it is a latent image; of this we are firmly convinced by an experience that has never met with an exception to the rule, we have therefore a lively faith in the result; in the latter case, therefore, *experience and faith become our guides.* They are equally our guides in dry plate photography.

Nihil siccis faucibus recte suscipitur, neque perficitur, is an adage taken advantage of by the intelligent wet process advocates; but adages, like nostrums, are not universal in their application; times and circumstances modify all such deductions. The author of the following instructions in dry plate photography adheres tenaciously to the wet process, admits its pre-eminence in general practice; but he is not only willing to recognize advantages peculiar to the dry process, and applicable on certain occasions, but he recommends this process as the only one to be adopted under the circumstances in question.

Whenever a *wet plate* becomes *dry* by evaporation, when exposed to the view, before the actinic impression is complete, the dry process is to be preferred from sheer necessity; for the dry tannin plate may be exposed without deterioration for a whole day, a week, or a month, and until the necessary impression has been obtained.

The practical operator will find the dry process much more advantageous than the wet process in taking photographs of public buildings, architectural structures, gentlemen's residences, country seats, farm houses, shipping, steam engines, machinery, monuments,—in fine, all works of art and beauties of nature in still life in his own city or immediate neighborhood. Even if the operator should possess a portable tent, in the cases just enumerated the dry plates are to be preferred in every instance whenever a picture of a single building, etc., alone is required. The reason is almost self-evident. To hug or drag a portable tent and camera to the place in question; to mount them on tripods for operation; to place the collodion bottle, the bottle containing the developer, the water bottle, and the bottle holding the fixing solution, each in order; to expose, develop, fix, wash the plate, and stow it away in a safe place where no accident can befal it; to pack up again all these paraphernalia and retrace, with bag and baggage, the homeward path—all these operations contrast very distinctly with that of carrying on the shoulder a small camera already screwed to its tripod, and ready for operation the moment the goal is attained. The camera is lowered, the view adjusted in focus, the picture taken before an accumulation of human youngsters can stop up the aperture of the lens or diversify the scene on the collodion plate with innumerable ghosts. The camera came and is gone before the inquisitive have had time to ascertain the cause of your appearance and departure.

The same advantage is manifest on the side of dry plate photography whenever an indefinite number of views have to be taken in a city, each one remote from the rest. In this case the whole burden consists of a camera, tripod, and a changing box.

The dry process, in the cases enumerated, requires but one operator. The wet process would require at least two.

The amateur photographer and the tourist will invariably give preference to the dry process. Even while the train stops at the station, or the steamboat at the landing, the energetic tourist has time and facilities by this process to carry away a picture, a visible reminiscence of towns and harbors, which may serve to illustrate his diary or give pictorial beauty to his correspondence. With the wet traps he can accomplish nothing of the kind; neither the train nor the steamer waits for any man beyond the appointed four or five minutes, which are quite sufficient for an actinic impression, but not to mount and remount a photographic dark chamber. While other indifferent travelers step on shore or on land to straighten their legs or wet their whistles, our tourist, philosopher, and poet, with quick eye, has already discriminated the beauties he wishes to depict before he dismounts, now marches to the desired point, adjusts the lens to focus, counts the time, and is already again in his seat before his neighbors have had time to slacken their crural extensors or modify their pharyngial passages. This is taking pictures on the wing.

Finally, transparent positives, opal or porcelain pictures, transparent stereographs, and photo-miniatures are very easily and beautifully prepared on dry plates, sometimes more easily than on wet plates, and in some instances where it is impossible to take them at all by means of wet plates. To print on glass, that is, on dry plates, has become one of the most enchanting operations in photography, as an evening recreation by gaslight. This light, or the light from a small piece of burning phosphorus, or a few spirals of magnesium wire, is quite intense enough to produce the required actinic effect on a dry plate in a few minutes. During the summer season—the season for trips and excursions—negatives accumulate to a great extent, and remain on hand unprinted until the dreary winter arrives, when nature lies buried in sepulchres, as it were, clothed in white raiment, and when homes become irksome without employment; now is the time, in the long evenings, with our wife and children around us, to bring the negatives from their niches, take impressions of each by the dazzling jet of light from the argand burner on the table, and recount to them, in the midst of such vivid illustrations, the stories and histories arising from scenes visited or renowned. This source of innocent and instructive pleasure is inexhaustible, its enchantment can not be described; it can be understood only by those who have participated in it.

A friend of ours, the other day, in all earnestness asserted that if the dry process did not exist, or some equivalent process, he should forego photography and procure himself a lathe with a slide rest and eccentric chuck, and take to turning cycloidal gyrations in boxwood. Such an expression as this is totally unintelligible to a common operator with the wet plate process. Let him, however, be able in the evening, with his dear ones around him, to prosecute gaslight photography on *dry plates;* he will be carried away with the ravishing pastime, and with Milton he will exclaim: "Into the heaven of heavens I have presumed, and drawn empyreal air."

Photographers in general have hitherto been deterred from trying experiments with dry plate photography from the circuitous mode of preparing the plates, from the tendency of the film to peel off in the very midst of the development, or in the final washing, or from the want of success in securing a picture.

If we can teach a method of preparing dry plates that shall deviate very little from that of preparing wet plates, we hope to be able to enlist many of our practical men to take up this useful and beautiful branch of the photographic art. It is our belief that such instruction can be given. Thus, the plate is prepared exactly in the same manner as for the wet process; it receives the same substratum of albumen, is coated with the same collodion, sensitized in the same silver bath, washed at the tap like an ordinary negative, and in other respects treated in a very simple way. We do not maintain that this is the best method, nor do we presume to teach the best method; but we flatter ourselves with the belief that the method here explained will be as successful in the hands of others as it is invariably in our own, naturally on the single condition that our scholars are obedient and observant of all the rules we prescribe.

The developer, too, is the ordinary pyrogallic developer or intensifier of the wet plate. With such simplicity of operation failure can scarcely occur.

The tendency of the film to split up or peel off is entirely obviated by the previous substratum of dilute albumen; and when the pupil is sufficiently advanced and experienced, even this substratum can be omitted, with the exception on the edges.

The want of success in securing a picture on a dry plate has arisen principally from impatience and hurry, and the aim of dry plate photographers, being to shorten the time of exposure, has all along conduced to hurl beginners into the trouble alluded to. Be convinced that the sensitiveness of a dry plate is far inferior to that of a wet plate, five or six times less, that is, if a given lens with a given stop, light, and exposure, will produce a picture on a wet plate in twenty seconds, the same lens will require, under the same conditions on a dry plate, about two minutes at least, and most probably four minutes' exposure would be no injury to the result sought. Do not be beguiled by any assertion of others, or any desire of your own to diminish the time of exposure; you will fail assuredly if you do, and will then condemn a good process. The dry plate requires a long exposure; and learn now that over-exposure is no injury, because there are means of controlling its effects, but there are *no* means of remedying an under-exposed dry plate, that is, of getting a picture on a film where light has failed itself to perform its part of the wonderful task. It is true that the alkaline developer, as it is called, has a tendency to shorten the long exposure, but it increases in the same ratio the chances of failure; and although we ourselves are delighted with the results of the alkaline developer, as well as with an alkaline treatment of the dry plate previous to exposure, we recommend it to our scholars not as a normal practice, but rather as a means to be adopted if we know beforehand that the time of exposure, by whatever circumstances, was too short.

Our older and more experienced readers may be inclined to think that a long exposure gives room for great disturbances in the picture by means of the wind or waves; such an idea is very natural, but our friend, Mr. Hull, one of the most successful of amateur dry plate photographers in the city of New York, has set us to rights on this score by the results of his experience, which manifestly shows that there is no more disturbance produced by the wind during a long exposure on a dry plate, than by the same cause during a short exposure on a wet plate; furthermore, our own experience proves indisputably, that a cause which would be ruinous to a wet plate would be scarcely perceptible on a dry plate. Thus, a carriage moving slowly along the street, would certainly spoil the picture on a wet plate, by producing a feeble image of the vehicle as it moved along; whereas, on the dry plate the result most probably would be imperceptible.

But we have before observed that the province of dry plate photography is *properly* with still life, where the wind and the waves have no influence in producing motion, and where success is most certain. Keeping, therefore, dry plate photography within its prescribed limits, we have no hesitation in asserting and believing that the results of success with this process will be more numerous than with the wet process, and that the labor required to produce these results will be much less by the former process than by the latter. Having made these few introductory remarks, which we deemed necessary, in order to institute a right sort of feeling on the subject and acquaintance with it at the outset, we shall now proceed to our pleasant task of once more imparting instruction on a subject which forms a part of our practice, and which we hope to improve by teaching:

Discimus docendo.

CHAPTER I.

PREPARING THE PLATES.

It is desirable in dry plate photography to make use of flattened plate-glass, because it will frequently happen that you may desire to take transparent copies of your negatives on dry plates. In this case, the two surfaces, that is, the surface of the negative and that of the dry plate, which is intended to receive the picture, must be accurately in contact in every part. With common glass this condition can seldom or never be attained. The glass must be free from all sorts of flaws or imperfections, because it would be a great loss of time and material to go to the trouble of preparing a dry plate, and know beforehand that the result, nine times out of ten, with such imperfections staring you in the face, must inevitably be imperfect. Some dry plate photographers are so particular in regard to their glass, as never to use a plate that has already been once coated with the sensitive substances. This degree of refinement and care is, in our opinion, unnecessary, although we are willing to admit that better results are more likely to be obtained by such a precaution, and the ordinary mode of cleaning glass, than by using old plates over again; but if old plates be cleaned in the manner hereafter described, they may be coated several times in succession without any detriment to success.

Each plate is cut, with the diamond, of the required length and breadth, and the sharp edges are carefully filed or ground off on a grindstone. The latter method is by far the neatest and most expeditious, if a grindstone is conveniently at hand. Such a grindstone as is used by jewelers and dentists, and turned by a treddle in a lathe, is exceedingly well adapted for this purpose. For some of the changing boxes in the market it is necessary, furthermore, to cut off the four corners of the plate, and then grind them round, so as to present no impediment to the sliding of the plate out of the changing box into the plate-holder, and then back again into the changing box after exposure. The plate, so far prepared has the following appearance:

Other changing boxes, on the contrary, by reason of a different construction, do not require anything more to be done to the plates than to cut them into a rectangular shape, and to abrade the edges, as in the preparation of wet plates.

The plates at this stage are now immersed in a pail of clean water, and left there for half an hour or so. Each one is then taken out, washed on either surface with a clean sponge, again immersed and washed, until the two surfaces are perfectly transparent and clean. Finally the plate is well agitated in fresh water, and then immediately submitted to the next operation, which consists in coating one surface with a solution of albumen, as hereafter described.

When plates have been used before, and are still covered with collodion and varnished, another treatment is necessary. In this case the negatives are placed in a glass or porcelain vessel containing twenty parts of water and one part of nitric acid, and raised to the boiling temperature, when it will be found that the collodion film and varnish will immediately separate from the glass. A stronger bath of nitric acid at a low temperature will subserve the same purpose. Be careful in manipulating with a strong solution of this acid to avoid getting the acid on the hands or clothes; this object is easily attained by using slips of glass for raising the plates out of the bath.

Carey Lea's bath for removing collodion films or impurities from glass plates is most excellent; we use it invariably in our laboratory for the purpose in question, and frequently we throw in new plates of glass, whereby all rust appears to be removed, and the surfaces are rendered beautifully clean. This bath is highly to be recommended, and is prepared as follows:

Bichromate of potash . . .	1 ounce.
Sulphuric acid	1 ounce.
Water	16 ounces.

As soon as the salt is dissolved, the bath is ready to receive the old plates; these are allowed to remain several hours in the bath, which separates the films and removes extraneous substances from the surfaces. The bath can be used over and over again, for a long time; it may be strengthened from time to time by the addition of fresh crystals of bichromate and of sulphuric acid.

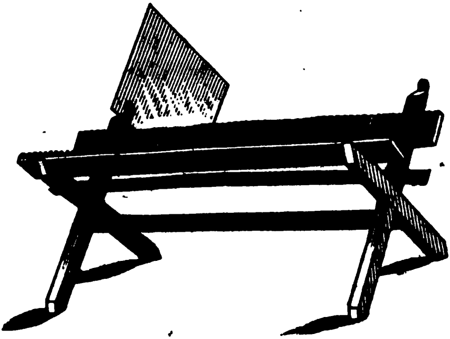
The plates are raised from this bath in like manner, by means of slips of glass; they are then allowed to drain for a moment, and finally thoroughly washed in pure water, and placed on the draining racks to dry, if the surfaces are intended to be polished afterward; otherwise each is ready as soon as it is washed to receive the substratum of albumen, which is prepared as follows:

Separate the white of a single egg from the yolk, and beat it well up into a froth, then add to the froth six ounces of pure rain or distilled water and one drachm of ammonia. Shake the mixture very intimately together in a bottle, which must contain at least twice the quantity of material, that is, about a pint measure. The solution is next filtered through a tuft of cotton wool; it might be filtered through coarse filtering paper, only in this case the solution assumes a very slight tinge of straw color in passing through the paper. This arises probably from the fact that the sizing of the paper is dissolved by the ammonia. It is preferable to avoid this coloration, by using only a clean tuft of cotton inserted in the neck of the filter. The first part of the solution, to the amount of about an ounce, is poured back again into the filter, because it probably has taken down with it a few fibres of cotton, which would be injurious in the subsequent operations, if left on the film. The vessel, too, which receives the filtrate at this stage is carefully washed out with clean water, and the filtration is allowed to proceed to the conclusion.

The plate having been well washed, as already described, is either fixed on a pneumatic holder, or held by one corner, between the thumb and forefinger, as a plate is held for the reception of collodion. The albumen solution is then poured upon the extreme right-hand corner, and is allowed to flow sidewise to the distant left-hand corner, and then downward toward the hand, driving before it the moisture still adhering to the surface, and passing off at the nearest right-hand corner, into the vial containing the solution. It frequently happens during filtration that innumerable small air bubbles are formed on the surface of the filtrate; this may partially be avoided by dipping the beak of the glass filter into the solution, or by not allowing the solution to fall more than half an inch or so before it reaches the vessel beneath. Should it so happen, however, that the albumen solution contains a quantity of these air bubbles, they must be blown away to the opposite side of the vessel before you begin to pour the solution upon the plate; otherwise, if you once get them upon the plate, you can rarely get rid of them without flowing the plate two or three times, a process which is likely to produce an uneven film and to generate a fresh crop of bubbles. In pouring the solution upon the plate, it is advisable to place the spout of the vessel near the surface of the plate, in order thus to obviate as much as possible the generation of these offensive bubbles, which if left on the film will produce transparent circles in the picture, visible after all the operations are ended. To coat the plate evenly and uniformly requires gentleness of action combined with the preceding directions; a quick and boisterous demeanor will not succeed at all.

Another mode of coating plates, and one which is generally used when the plates are dried and polished, is the following:

Place at the bottom of a clean, flat porcelain dish, along either end, a slip of glass of about half an inch in width, and then pour into the dish a sufficient quantity of the albumen solution, so as just to cover the slips of glass. Now taking in the hand a plate of glass which has been already washed and polished, let one end rest upon one of the slips of glass, and gradually and slowly incline the plate down upon the solution, carrying thus all bubbles before it as it sinks, until, finally, the other end rests upon the other slip of glass. The solution in the dish must not be high enough to cover the plate as it now lies on the slips of glass, but simply to moisten the under surface completely. The plate is now gently raised out of the solution, by means of another slip of glass, allowed to drain by resting one corner on one of the glass slips in the dish, and then reared away to dry on the rack. There are various ways of making these drying racks; we will describe one which we use ourselves. It has the following appearance: It is constructed of four pieces of half inch stuff, of the following shape and size; 16 inches long, and contains 28 dentations.



The figure of the drying rack will show how the four pieces are to be tacked together. It will be observed that the dentations upon which the plates rest are not rectangular, but triangular; the object of this construction is to place the albumen or collodion film on the side looking toward the inclined side of the dentation, whereby it will be prevented from any injury from friction; whereas, if the edge were perpendicular, the collodion film would be sure to suffer. A number of these racks will be found very useful, in fact, indispensable; hence the minuteness of the description, in order that the operator may construct or have constructed a proper number at the beginning, and thus save himself much trouble afterward, which would inevitably ensue without them. After being carefully polished with sand-paper, they are coated with two or three coats of varnish, and when dry are ready for use.

When the albumen film is quite dry, it is hard and transparent; and the albumenized surface is almost indistinguishable from the glass. By taking care to place the albumenized surface always toward the inclined plane of the dentation you will have no trouble in recognizing which surface has to be coated with collodion.

This film of albumen adheres with great tenacity both to the glass and to the collodion which is afterward poured upon it, and thus prevents the collodion film from ever slipping or peeling off. In consequence of this we recommend you for some time to follow the plan here described of coating the glass with albumen; but as soon as you are quite conversant with all the manipulations of dry plate photographic manipulations, you may abandon this plan, and resort to the following expedient for subserving the same purpose, but with more care.

The same albumen solution is used here as before; and let me remark, that where the solution is to be preserved for future use it is well to throw into the vial a few particles of camphor, to prevent decomposition.

Procure a camel's hair pencil and a handle to insert it on. Tie the pencil to the handle, by means of silk thread, in such a manner that the handle and the pencil lie side by side, the end of the former projecting about a quarter of an inch beyond the hairs of the latter. Now dip this end of the combination into the albumen solution; a small quantity will adhere to the pencil. Resting the projecting end against the edge of the polished plate, and allowing the wet pencil to touch the surface of the plate, press gently upon it and proceed from one end to the other, leaving thus a streak of the albumen along the surface. The object of the projecting end of the handle is to prevent the pencil from making too broad a streak; if the latter is three-sixteenths of an inch in width, the protection to the collodion film will be sufficiently assured. Varnish each edge of the plate in the same way all round. The plates thus prepared with a streak of albumen on each edge are reared as before on the drying rack, and in the same manner in reference to the albumenized edges and the inclined plane of the dentations, so that there may be no mistake in coating the unvarnished side afterward with collodion.

Some photographers postpone this varnishing of the edges until the plates have been coated with collodion, sensitized, and exposed. It is certainly not so convenient then as now; and, consequently, we advise our readers to pursue the plan prescribed.

Other solutions, too, are frequently used instead of albumen; such, for instance, as india-rubber dissolved in benzole or in chloroform, as also solutions of gelatine, etc. The latter we have used and become thoroughly disgusted with it, because it is so apt to undergo a sort of fermentation, by which the collodion picture develops in a most horrid manner. The former solutions may be recommended merely as a variety in the manipulation.

The india-rubber solution is made by soaking a grain of this substance in sheets in one ounce of benzole for a day or two. The india-rubber is cut up into very small slices to aid the solution; and the mixture is shaken every now and then for the same purpose. When convenient, the mixture is filtered several times through fresh filtering paper, when the solution will be found ready for use. Before the plates are coated with this liquid, they are thoroughly dried over a flame, or at the stove, and then allowed to cool again. The solution is poured upon the surface like collodion, and the film is dried gently by artificial heat, and the plate is then put away for the next operation. The following solution is also recommended for the same purpose:

India-rubber	2 grains.
Amber	1 "
Chloroform	4 drachms.

Soak, dissolve, and filter as before. This solution dries more readily than the preceding. Where india-rubber solution is used, the plates soon dry and are quickly ready to be coated with collodion; whereas, if a solution of gelatine or of albumen is employed, the films do not dry so quickly, and the operation is thereby impeded. The solution of gelatine recommended for this purpose is prepared as follows:

Prepared gelatine . . .	20 grains.
Water	8 ounces.
Glacial acetic acid . . .	5 drops.

Soak the gelatine for a few hours in the water, then dissolve by heat, and filter several times through a moist filter. The plates may be coated with this solution in the manner already recommended for the albumen solution. To obviate the troubles which arise from the use of a gelatine substratum, and to produce at the same time a very tenacious film, it has been found advisable to coat the gelatine film with one of the india-rubber solutions just described.

We have mentioned a number of the solutions used in the preparation of dry plates, but do not use any other ourselves than the one first described, that is, the albumen solution; and even this we frequently dispense with excepting to varnish the edges before the plates are coated with collodion.

For this purpose the plates are polished after they have been carefully washed and dried. The plate is fixed in the vise in such a manner that the upper surface stands slightly above the ledges of the vise that holds it. A little rotten-stone is then dusted upon the surface, and a few drops of alcohol are poured upon the dust; the mixture is intimately rubbed over every part by means of a large velvet cork covered with Canton-flannel, or wash-leather. When the surface is dry, the extraneous powder is rubbed off with a piece of clean Canton-flannel, and then the surface is well polished with a large cork covered with soft chamois leather. Finally, breathe upon the surface; if the film of breath is uniform and free from lines or curves, the glass is properly polished; if not, breathe again upon the surface and polish it with the chamois rubber; repeat the operation until uniformity in the breath film has been attained.

Finally, to sum up our instructions in this chapter, follow minutely the following order:

1. Cut out the plates and abrade the edges.
2. Place them in the bichromate bath, if necessary.
3. Wash them thoroughly, and coat with the albumen solution, or,
4. If the edges alone are to be varnished place the plates in the draining stand to dry, then polish the plates and varnish the edges as described.

In all these operations the utmost cleanliness is required, and the room must be kept as free as possible from dust. This is effected by first dusting and sponging the shelves, etc., with a moist sponge, then sprinkling the floor with water.

The plates being all covered on one surface with a substratum of albumen, or varnished around the edges, and placed in readiness on the drying rack, we are now ready for the next operation in order.

CHAPTER II.

The negative collodion sold by any of our large photographic establishments in the city will be suitable for the preparation of dry plates. It is not maintained that the most sensitive film can be obtained by any of them; but we have used all of them, and find that dry plates can be prepared with them that will answer the purposes intended. If we manufacture our own collodion, which is seldom the case, we use the following formula:

COLLODION FOR DRY PLATES.

No. 1.	Alcohol	10 ounces.
	Ether	10 ounces.
	Pyroxyline	120 grains (more if required).
	Bromide of cadmium	100 grains.
	Iodide of ammonium	60 grains.

OR,

No. 2.	Alcohol	10 ounces.
	Ether	10 ounces.
	Pyroxyline	120 grains (more if required).
	Iodide of ammonium	80 grains.
	Iodide of cadmium	40 grains.
	Bromide of cadmium	40 grains.

Separate the cotton into small tufts or flocks, and introduce them into the ether, then pulverize the salts in a clean mortar and dissolve them in the alcohol; finally, add the two mixtures together, shake intimately, and set the solution aside for a day or two to settle. The collodion must now be filtered, and is then ready for use.

Before you proceed to coat a prepared plate with this collodion it is necessary first to try its working powers.

Coat an ordinary polished plate with the collodion, and see whether it flows easily over the plate, and possesses at the same time a sufficient amount of consistency as to form a tolerably thick film without producing a reticulated surface; if this be so, there is no doubt a sufficiency of pyroxyline in the collodion. If, on the contrary, the collodion flows almost like alcohol or water, the film will not be suitable for a dry plate. Having obtained a proper degree of consistency, allow the film to dry on the plate. If when dry the film is transparent and almost undistinguishable from the glass, it is suitable for the preparation of a dry plate. If, on the other hand, the dry film is opaque or opalescent, the resulting picture, on a plate prepared with such collodion, will not be normally good, and it is better not to lose your time in the preparation of plates which it is known beforehand will not yield the best results.

When the collodion film is opaque after drying, the pyroxyline, most likely, is in fault, if you know certainly that the alcohol and ether are as nearly absolute as can ordinarily be obtained. Should the latter, however, be dilute, they of themselves, in such a condition, will be sufficient to produce the opalescence alluded to.

After you have ascertained that the collodion is capable of producing a shining, transparent film, it is necessary to proceed further, and make two other preliminary experiments previous to coating the plates with collodion.

One of these experiments is intended to ascertain whether the collodion is bromo-iodized to a proper extent for the purpose. To make the test, coat a small plate with the collodion in question, and after allowing the film to set, immerse it in the silver bath. If the film soon assumes a cream color in the solution, the collodion indicates a proper condition for working well;

whereas, if the film remains bluish after several minutes' immersion, this is an indication either that there is too small a quantity of pyroxyline, or that the bromo-iodides are not in proper proportion in reference to the different salts used, or in too small a quantity combinedly. If the collodion has the requisite degree of consistence, as indicated by the first test-trials, the defect is attributable to the salts, whose quantity and relative proportions have to be so modified until the desired effect is attained. The blueness of the film just alluded to, however, more generally is owing to a want of more pyroxyline, and hence of more of the bromo-iodizers, as a consequence. Add, in such a condition, both more cotton and more of the salts. Bear in mind, too, that the ammonia salts have a tendency to make the collodion more thin, while the cadmium salts have an opposite tendency, and render it more consistent and glutinous.

The other experiment is now to see whether the collodion produces those acicular specks or pinholes, which are the very bane of a good photographer. Consequently coat with collodion, sensitize the film, expose, develop, fix, and wash. The film now can be examined; if the pinholes are absent you are a lucky man; if not, you must proceed a few steps further. The first thing you have now to do is to filter the collodion. Place rather loosely in the neck of the funnel a small piece of clean and dry cotton-wool, and pour the collodion into the funnel, which is supposed to be supported on a retort stand, or otherwise in such a way as to enable you to collect the collodion in a bottle beneath, as it filters through. A piece of glass is placed over the funnel to prevent the evaporation of the ether. The first portions of the filtrate, which may contain fibres of the cotton, are poured back into the collodion on the filter, a fresh, clean bottle is placed beneath to receive the clear coliodion, and the bottle previously used is thoroughly rinsed out with ether, which is added to the collodion in the funnel to make up for that portion which is lost by evaporation. This mode of filtering is somewhat defective, because of the loss of ether by evaporation, and of the consequent coagulation of the collodion itself around the cotton in the neck of the filter, whereby the filtration is frequently impeded or entirely stopped. Collodion filters can be purchased, which obviate this defect altogether. The collodion is completely isolated from the air, excepting that portion which is contained in the filter and receiver; and an arrangement is made in the neck of the filter, by which the collodion can pass downward through the cotton, while an equivalent quantity of air from the receiver beneath passes upward to take its place. Such filters are almost indispensable in every photographic establishment, and may be relied upon to perform the operation for which they are constructed.

It is advisable to filter the collodion at least twice; by this means it will become completely deprived of undissolved particles both of pyroxyline and the bromo-iodizing salts.

Another experiment is now made, as before, to see whether the pinholes still exist or not; if they are still present, filter the silver solution, and wash out the bath very carefully. Return the filtered solution, and try the collodion once more. If the acicular plagues are still present, you must add a few ounces of rain or distilled water to the silver bath, filter once more, and then finally add a quantity of the crystals of the nitrate of silver, proportionate to the number of ounces of water first poured into the solution, to produce a precipitate. After all these operations have been performed, the collodion, as a general rule, will be found to work well, and you may now proceed to the next operation, which consists in sensitizing the collodion film. The remaining part of this chapter you may skip over, and read at your leisure.

The late Mr. Glover made several excellent experiments in reference to the manufacture of pyroxyline for the tannin process. For those who may feel inclined to prepare this article themselves we insert Glover's formulas, as also those of Major Russell.

The clean and pure cotton of commerce, either Egyptian or American, the former being preferred, is first purified of a certain quantity of gummy substance which it contains, by the following expedient:

FORMULA FOR PURIFYING COTTON FOR THE MANUFACTURE OF PYROXYLINE.

Carded cotton	4 ounces.
Potash	2 ounces.
Rain-water	10 pints.

The water is first raised to the boiling temperature in a glazed porcelain or glass vessel; the potash is then dissolved, and the cotton introduced. The mixture is kept boiling for a couple of hours, a sufficient quantity of water being added from time to time to make up for the loss by evaporation; and the whole is frequently stirred with a glass spatula. After this operation of boiling, the cotton is taken out and thrown into a running stream of water, or washed in several changes of water, in order to remove every trace of the alkali. The absence of all alkaline reaction is shown by red litmus paper, which remains unchanged in the wash water. If this paper turns slightly blue, it is a sure indication that the alkali is still present. The cotton, being thus perfectly freed from the alkali, is dried perfectly by the heat of the sun, or by artificial heat. This is Hardwich's method of preparing cotton for the preparation of pyroxyline.

GLOVER'S FORMULA FOR PREPARING PYROXYLINE.

Sulphuric acid (sp. gr. 1.845) .	10 ounces.
Nitric acid (sp. gr. 1.37) .	5 ounces.
Water	2 drachms.
Cotton (prepared by the above formula)	300 grains.
Temperature	145° Fahr.
Time	10 minutes.

A water bath is prepared, in which the water is raised to the temperature of 145° and maintained at this heat. The acids and water are mixed together in a separate vessel, which is placed in the water bath. As soon as the temperature of the mixed acids has lowered to that of this bath, that is, of 145°, the cotton, which has previously been divided up into light tufts, is introduced quickly, one by one, into the acids, and thoroughly immersed. As soon as they are all in the liquid, and not matted together, the vessel is covered up, and allowed to stand at the given temperature for ten minutes. At the expiration of this time the cotton is taken out by means of two glass rods or spatulas, and thrown into a pail of water; by this immersion the largest proportion of the acids in the altered cotton is removed. The remaining parts of the acids is removed by working around the cotton in a running stream of water, or in several changes of fresh water. To the last change of water about ten grains of bicarbonate of soda are added. Every trace of acidity must be removed; and the entire absence of acidity is indicated by means of blue litmus paper, which remains blue in the wash-water; the paper, however, turns red, more or less rapidly, according to the quantity of acid still present. The cotton by this process has become altered, has combined with some of the elements of nitric acid, and has increased in weight; it is now denominated pyroxyline. This pyroxyline is taken out of the water, separated into small tufts, and placed on a large sheet of paper to dry in the sun. It is preferable to dry pyroxyline in the sun rather than by artificial heat, in order to avoid explosions, which have been very disastrous even in experienced hands. When thoroughly dry, the pyroxyline is divided up into ounces and carefully packed in card-board or tin boxes for future use.

Collodion, which produces a *dense and horny* film, is well adapted for the tannin process; but such a film is not so sensitive as a *porous* film. Both these conditions in the film depend in a great measure upon the nature of the pyroxyline, which is modified by the temperature of the acids in which the cotton is immersed. Thus a high temperature produces a porous film; and the same effect can be produced by a larger proportion of water in the acids, a longer immersion and a lower temperature. Collodion prepared from cotton prepared according to Glover's formula is very sensitive, and flows easily over the plate. For this collodion two grains of iodide of ammonium and six grains of the cadmium salts to the ounce will work well.

The formula which Major Russell uses for his collodion in the tannin process is the following:

THE TANNING PROCESS.

Alcohol (.805 sp. gr.)	10 ounces.
Ether	10 ounces.
Pyroxyline	120 grains.
Iodide of ammonium	20 grains.
Iodide of cadmium	67½ grains.
Bromide of cadmium	52½ grains.

There seems to have been lately a desire to set aside the iodides altogether in dry plates, and to depend solely on the bromide of silver. Mr. Sayce's latest experiments, which appear to have been crowned with decidedly successful results, have been founded entirely on bromide of silver diffused through the collodion, which naturally has to be kept in a dark or non-actinic place. My own experiments, in trying to reproduce these results, have not been so successful; a picture, it is true, was easily obtained, but exceedingly faint, and incapable of the requisite intensification. The defect alluded to is manifest also, to some degree, in the bromide process, as marked out by Major Russell himself. He remarks on this subject as follows:

"Bromo-iodized collodion will produce good results, but simply bromized collodion is strongly recommended as being in most cases preferable; the latter is about twice as sensitive as the former; and seems, so far as it has been tried, to have no tendency while in the exciting bath to form needle-shaped crystals, which are so common an annoyance when the collodion contains iodide. Above all, the bromized collodion will produce a better negative when the subject presents great contrast, such as sky and dark objects, as it will bear over-action of light better, and shows no tendency to produce blurring along the edges of the strongly lighted parts of the subject.

"Bromized collodion seems to be particularly suitable for use with tannin. In a great number of trials with different kinds of collodion, and various modes of treatment, the iodide and bromide in no one instance approached the bromide in sensitiveness, even when the latter was used in a much less sensitive collodion, or in quality of negative with a landscape subject when both were exposed long enough for the darkest parts.

"Two precautions are necessary when bromide alone is used: First, not to use a very slow-setting collodion; probably almost any sample intended for the wet process will answer. Second, to excite in a strong bath, and keep the plate in long enough."

He further on remarks, that collodion made with Glover's pyroxyline does not set quickly enough, but may be made to work correctly in this respect by using cotton immersed in the mixed acids at a temperature of 125° Fahr. and keeping it there for 20 minutes. The remaining treatment is the same as already described. The gain in weight by such a proceeding is about 50 per cent.

The bromized collodion recommended by Major Russell is composed as follows:

"Pyroxyline	5 grains.
Bromide of cadmium . . .	8 grains.
Alcohol (.805 sp. gr.) . . .	4 drachms.
Ether	4 drachms.

"Put the whole in a tall, narrow bottle, shake up until the solution of the pyroxyline and the bromide is complete; then allow to settle clear and decant. If the alcohol is weaker, or if the pyroxyline is of a kind likely to give too little setting power, a larger proportion of ether should be used.

"The addition of a few drops of astrong alcholic solution of bromine* to an ounce of the collodion seems to be an improvement; but bromine can only be used with a quick-setting collodion, as it tends still more than bromide to retard the setting. The yellow color given by the bromine will probably soon disappear, but the collodion will retain an acid reaction."

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* Take equal parts by volume of bromine and alcohol to make the alcoholic solution recommended.

Although bromized collodion may be more sensitive than bromo-iodized collodion, it is much more difficult to obtain intensity by the former than by the latter; besides this, it requires a longer time to reduce the bromides in the collodion into bromide of silver, than to produce the same result from the iodides or bromo-iodides. The same want of intensity appears to be the drawback in Sayce's new process of preparing dry plates without the silver bath; the image is easily brought out, but in our hands, hitherto, it lacks vigor. This is probably owing to the fact that bromide of silver alone is employed in the production of the image.

The reader, therefore, is advised at present to adhere to the collodion formulas given at the beginning of the chapter, or to make use of the collodions prepared by our first-class photographic establishments.

CHAPTER III.

SENSITIZING THE PLATES.

To sensitize the plates for the dry process is a compound operation; and, by reason of much formality, has deterred many operators from having any thing to do with the process. Three solutions are required in the first place—namely, the silver bath, the tannin solution, and a solution of any of the bromides.

SILVER SOLUTION OR BATH.

The best results are always obtained with a strong acid new bath; it is true, that any silver solution that answers for the wet process will be suitable for the dry process, but the best conditions can not always be thus obtained. If convenient to have a separate bath for the dry process, prepare it in the following manner:

Pure crystallized nitrate of silver .	4 ounces.
Distilled or rain water . .	32 ounces.
Acetic acid	1 drachm.

Divide the bath into two halves and saturate one of them with well-washed iodide* of silver. This is effected by mixing with this half an excess of iodide of silver, and shaking the mixture thoroughly; the solution is then filtered and mixed with the other half for use. A stronger solution of silver can be kept on hand ready for strengthening the bath when required. More acetic acid can be used with advantage in the dry process than in the wet process; but it must be remembered that it tends to diminish the sensitiveness in some degree, at least such is the received opinion. For our own part we do not think it has much influence in this respect, because all the free acid is entirely removed by the subsequent operations, and the sensitiveness depends upon the tannin solution with which the film is coated. Keep the bath in a place free from dust; that is, cover it up when not in use; and when it becomes saturated with alcohol and ether, boil it until these ethereal solutions have evaporated, and then filter the bath for use again.

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* Add to a solution of twenty grains of iodide of potassium nitrate of silver in solution as long as there is any precipitate; the precipitate, when settled, is separated from the nitrate of potassa, and washed in several changes of water.

TANNIN SOLUTION.

There is, no doubt, a difference in the various specimens of tannin in commerce, but as yet we are not in condition to say which is the best; this much, however, is known, every variety of tannin may be used, and with almost equal advantage, after it has been kept in solution some time and filtered; for by this means the impurities have time to settle, and by filtration are removed.

Commercial tannin . . .	4 drachms.
Distilled or rain water . .	16 ounces.
Loaf Sugar	4 drachms.

Shake the mixture well until the solution is complete, and put it aside for a day or two. After this time it may be filtered through moist filtering paper. The filtration can be repeated several times. Finally, add half an ounce of alcohol to the solution. By use this solution receives particles of dust, which must be removed by filtration every time it is used for the preparation of a fresh quantity of dry plates. A larger or a smaller proportion of tannin than that indicated in the formula may be employed without making much difference perceptible in the results, as long as the plates are immersed sufficiently long in the solution to produce the proper degree of sensitiveness. If the alcohol be omitted in the tannin solution, the latter is apt to grow mouldy on the surface ; but after filtration we have not observed that such a solution has been in any way impaired in its sensitizing properties. The alcohol therefore seems to be added simply to prevent a film of mouldiness, which necessitates filtration.

BROMIDE SOLUTION.

Bromide of cadmium . . .	1 drachm.
Distilled or rain water . . .	6 ounces.

We are now ready for the sensitizing operation. Take from the rack a plate that has been already coated with albumen, or whose edges have been varnished with albumen, remove any adhering particles of dust from its surface, by means of a broad, flat camel's hair pencil, and then, after heating the plate to drive away the moisture and allowing it to cool, coat this surface with collodion in the usual manner ; after the collodion has set sufficiently, the plate is immersed in the silver bath, where it is allowed to remain until all apparent greasiness of surface has been removed, and the proper reductions have been effectuated. The film must now have a uniform, cream-like appearance ; if it is or remains blue or bluish, the collodion is in fault, or the time of immersion has been too short. Keep the plate in the solution until the desired condition has been attained.

It appears from the recent experiments of Poitevin on the sensitizing properties of tannin, that this operation of produeing either the iodide or bromide of silver in the collodion film may be performed in the light of day; but until we are quite certain as to the practicability of this plan, we recommend that the collodion plates be immersed in the silver solution in the dark or non-actinic room.

Supposing the color of the collodion film is cream-like and uniform, that is, free from all oiliness, raise it from the silver bath, allow it to drain, and then place it in a large flat dish of rain or distilled water, with the film-side upward.

In the mean while proceed as with the first plate, and coat a second plate with collodion; allow the film to set, and immerse the plate in the silver solution. While the reduction is thus going on in the silver bath, return to the first plate, take it out of the dish of rain-water, and wash the film under the tap, in the same manner as you would a negative.

This washing aims to remove all the free nitrate of silver and the other soluble nitrates, such as nitrate of cadmium and of ammonia, from the film. By washing alone this aim can not be thoroughly effected, at least it is so supposed, and consequently the next operation is intended to convert any trace of remaining nitrate of silver into bromide of silver. For this purpose flow over the film a sufficient quantity of the bromide solution two or three times, and return the residue into the stock bottle for future use.

The film is again washed under the tap to remove all traces of the bromide solution or the resulting nitrate of cadmium.

The final operation consists now in coating the film with the solution of tannin. This can be done either by pouring the solution two or three times backward and forward over the film, and allowing the residue to drain into the stock bottle, or by immersing the plate on a dipper in a vertical bath containing the tannin solution. The latter plan is more convenient; and while the plate is in the tannin bath, you can examine the plate in the silver solution; if the latter be ready, move the tannin plate up and down in the solution for about a minute, then raise it out, and, after it has sufficiently drained, place it in the drying chamber, and proceed with each successive plate in the same manner.

We find it to be a disadvantage to prolong the operations of washing in any of the stages too long; this is owing, probably, to the fact that the surface bromide or iodide of silver is removed by the mechanical friction of the water; let, therefore, the operation of washing be gentle. But we have, furthermore, observed that the results are still worse if the plate is made to pass through several changes of water in separate dipping baths, and thus allowed to remain for more than half an hour in the water. The cause may be the same in both cases—the mechanical removal of the fine pulverulent bromide or iodide of silver from the surface of the collodion, by disintegrating them from their attachment to the matrix. We prefer washing the plates at the tap, as we have just described, to immersing them in a series of baths, because there is always sufficient time to perform the whole operation before another plate is ready, and because the act is simple, effective, and free from all further outlay. The drying rack, which has been already described, may be used here; but in this case it must have been varnished with two or three coats of good varnish, and must be washed carefully, and dried every time it has to be used; otherwise, the parts upon which the plates rest, having collected impurities in the form of dust, etc., will be liable to contaminate the plates that are draining by capillary attraction. A simple plan of draining and drying the plates is to rear each upon one corner, standing on a piece of clean blotting paper, and to renew the paper as soon as the excess of fluid has drained off.

Drying chambers may be constructed for the purpose in question, by means of which the plates are thoroughly prevented from coming in contact with any thing that might in any way tend to soil them ; while, at the same time, all access of light is shut out. The author has such a chamber, which essentially is an oblong box, opening on either side, but closed in at the two ends, and at the top and bottom. On the bottom board at either end in the middle is screwed a small cubical block one inch high ; and stretching from each of these and screwed firmly to them is a piece of wood half an inch thick and one inch wide. Along the middle of this holes are cut, to receive pieces of glass tubing, each one inch in length ; these pieces of glass tube are easily cut from a glass rod, by filing a circle round the tube at the distance of one inch each from the end ; each piece then may be broken off with facility. The edges of the little tubes are either filed or ground on a grindstone. They are finally inserted in the holes on the longitudinal cross-bar, and cemented there by means of shell-lac, and in such a way that there is an equal portion of the tube above and below it. The holes in which the tube are fixed are one inch and one quarter apart.

The next part of the construction is to prepare a number of small blocks of wood, cubical in shape and one inch along each side. The number of these will correspond with the number of holes in which the glass tubes are fixed.

Apertures of the same size as those already mentioned are bored in the centre of one surface and proceed to within an eighth of an inch or so from the opposite surface. These apertures are for the reception of similar pieces of tubing to those above mentioned. These pieces are also fixed in their places by means of melted shell-lac.

Now cut off pieces of brass wire, one-eighth of an inch in diameter, or even thicker, and three inches in length. Flatten out either end of each wire on the same side, and drill holes through the flattened parts for the passage of small screws. A piece of wire is now screwed firmly to each block, and to that surface through which the hole does not penetrate but nearly reaches.

On the upper part of the box and in the inside, and along a line running longitudinally and parallel with the middle, a piece of inch stuff is screwed. This piece naturally projects downward into the box to the amount of one inch. To the under surface of this projection the opposite end of each wire just mentioned is screwed, and so that the opening of the glass tube in the block of wood at the other end looks downward and exactly overhead and corresponding to a glass tube beneath. The two glass tubes, the one above and the other below, are thus situated in the same perpendicular straight line. The distance between the nearest extremities of these two tubes must be about half an inch or three-quarters of an inch less than the length of the diagonal of the glass plates you use for the dry process. Owing to the flexibility of the wire, each block of wood admits of being pressed upward to the amount of one inch; and, when so pressed upward, the upper corner of a plate to be drained and dried is inserted into the open cavity of the little tube; the plate is then lowered until the opposite diagonal corner of the plate rests upon the open cavity of the tube below. The collodion film is always turned away from the hand and placed parallel to the end of the box which it faces. From the nature of the construction it is evident that the plate when so placed will be kept in its position by the elastic pressure of the wire above; also that the drainings from each glass will pass down each little tube, and may be caught in a proper receptacle below, or on blotting paper; and, from the fact that the plate comes in contact only with these two pieces of tubing in four small points, it seems improbable that stains can thus be produced. While the plates are draining and drying, the two side doors are left open, but the upper side or lid prevents the deposition of dust from above. In this position the prepared plates are left in the dark room over night or an equivalent portion of time, and then the side lids are adjusted in their places. The plates may thus be preserved until they are wanted.

It is immaterial whether the plates are allowed to dry spontaneously in a drying chamber as just described, or are dried by artificial heat, as long as the operation is uniform; but if there is any irregularity in the temperature on different parts of the same plates, it will be manifested by a corresponding irregularity in the collodion film when you come to the development of the image.

Plates are best dried in a steam-tight cupboard made of tin plate, and furnished with ventilating tubes to allow air to pass in and steam out, while at the same time all light must be carefully excluded. The sides, top, and bottom of such a cupboard are hollow cavities, into which steam is admitted from a small steam kettle situated close by, in which the water is kept briskly boiling by means of a lamp or small charcoal fire. The steam as it condenses is caught below; and the hot water thus procured is poured back again into the steam-boiler from time to time, as it accumulates. Such a drying chamber must also be furnished with pieces of glass tubes to hold the plates, or some equivalent arrangement, whereby capillary attraction can be prevented. Plates may thus be dried in five minutes or less, and are thus immediately ready for packing away or for use.

Upon the whole, we prefer this plan of drying plates by artificial heat; for the plates are dried not only quickly, but more thoroughly and uniformly than they can be spontaneously.

Dry plates are packed differently for transportation and for present use. In the latter case a proper quantity are placed at once in the changing box, to be described hereafter, or in small boxes furnished with grooves on two opposite sides for their reception, similar to the boxes prepared for melainotype plates. These boxes must be quite impervious to light. The plates are always packed with the film in a fixed and given direction, in order to avoid mistakes on exposure; otherwise it might easily happen, that the bare surface of the glass might be exposed instead of the collodion film.

For transportation or manufacturing purposes, dry plates are packed in a different manner. Rectangular pieces of thick paper are cut out, the size of the glass plate. The inside of these pieces are also cut away, leaving thus a sort of paper frame of about a quarter of an inch thick in width all round. Such a paper frame is placed upon the collodion side of the glass; over this comes another prepared plate, collodion side upward; then another rectangular piece of paper; and so on until a dozen or a score are thus placed completely together. An unprepared glass plate, or a prepared plate turned collodion side downward, is placed last. This appendage of plates is now folded up in several coverings of orange-colored paper, and finally stored away in small boxes made on purpose for their reception.

In all the operations previously described, from the moment that the plates are sensitized, it is absolutely necessary to exclude actinic light, even the light of a lamp or candle will be injurious. The author manipulates in comparative darkness. Without this caution the plates are liable to fogging, which is frequently attributed to the collodion, the silver bath, or developer.

Some authors recommend the film to be washed after it has been finally coated with the tannin solution. We do not think this operation necessary; in fact, it entails a loss of time, and it has been our opinion that the picture was less intense in those cases where the film had been so treated.

While performing the different manipulations described, the hands must be kept rigorously clean. To avoid stains that might arise from impurities from the hands, while coming in contact with different fluids, such as nitrate of silver, bromide of potassium, and tannin, the pneumatic holder will be found very convenient. But the same caution must be applied to keep this clean, though there is not the same amount of danger of stains to be derived from the holder as from the hands. When the holder is not used, it is advisable to rinse the hands thoroughly after the preparation of each plate; otherwise the last fluid used (tannin) may come in contact directly with nitrate of silver on the film, and this will certainly produce a stain.

Furthermore, if the plates are dried spontaneously by rearing them on one corner on pieces of bibulous paper, it is necessary to throw away every piece of paper that has been already used. See, too, that the shelves on which the plates are reared up, are well cleaned (even washed and dried) before you begin to prepare your dry plates. Let all your operations be neat and rigorously clean.

When the plates have been prepared as above described, and are quite dry, they ought to present a bright and polished surface, of a uniform cream-like hue, and free from stains and pulverulent deposit. If a plate is at this stage streaky, bluish all over, or in patches, dull (not polished) in appearance, or troubled with specks, it will be best to throw such a plate aside; whereas, if particles of matter merely are deposited on the surface, and the plate in other respects is good, these may be removed by a soft, flat camel's hair pencil, or by means of a tuft of cotton-wool. Considerable friction may be applied without endangering the collodion film.

As soon as you become expert in the manipulation of dry plates, all previous coating of the surfaces or varnishing of the edges of the plate may be omitted; but in this case, the edges of the sensitive film are now, that is, when the plates are dried, coated with a solution of albumen, and dried before exposure. If you use spirit varnish for this purpose, it is preferable to postpone varnishing the edges until the plates have been exposed, because this sort of varnish is apt to spread in radiations into the film to a considerable distance, especially if a very thin varnish is employed, and to destroy the sensitiveness of the adjoining parts of the film.

THE PREPARATION OF DRY PLATES IN COMMON DAYLIGHT.

The discovery, made by Poitevin about two years ago, that tannin is a sensitizer, as well as the asserted fact that a solution of an iodide, a bromide, or a chloride, when poured upon a collodion plate just removed from the silver bath and washed, destroys sensitiveness, has led to the attempt to prepare tannin dry plates, in a great measure, in ordinary daylight. Thus all the operations up to coating the plates with tannin need not be performed in a dark room, but in any convenient and comfortable place where light has free access ; the plates are prepared up to this stage, and then stored away in a dry condition, ready to be sensitized with tannin when required. We shall briefly describe the operations.

Clean the plates as usual, and coat them with a solution of albumen, as already described, and allow them to dry. Flow over the collodion, and immerse them in the silver bath, which may be placed in any convenient place in the laboratory. When the film has the proper color of creaminess, and is free from all streaks of oil, remove the plate from the bath, and wash it under the tap in distilled or rain water. Immerse it now in a bath of bromide of potassium, containing about four grains of the salt to the ounce of water, and let it remain there for a few seconds. The same end may be attained by pouring the solution of bromide of potassium two or three times over the surface of the washed collodion film. This operation is intended to desensitize the film ; and this is effected, in all probability, by the removal of all free nitrate of silver, by converting it into bromide of silver. The plate is finally washed, to remove the resulting nitrate of potassa, and is then reared away to dry, in order to be used when required. The plates, at this stage, are said to be no longer sensitive to light, but they contain a collodion film containing iodide and bromide of silver, one or both, which can easily be made sensitive by coating it with the tannin solution. After the film is thus made sensitive it has to be kept in the dark room, or away from all access of light until exposed.

This plan of preparing dry plates was first proposed in the *British Journal of Photography*, if we remember right, by Professor Himes, and followed up by Mr. J. Nicol, in the same journal. With all due respect to such authorities, we can not help thinking that, if a sensitive plate from the silver bath be once exposed to light for a moment, a change will take place in the film by reason of the free nitrate of silver, which can not easily be undone by any coating of an iodide, bromide, or chloride afterward. We will suppose, however, that they do desensitize the film; and, furthermore, that such a plate be immersed again in the silver bath and exposed in the ordinary way as a wet plate. What is the result when the iron developer is poured upon such a a plate? The whole surface becomes immediately black!

When the plates are sensitized with the tannin solution, however, Professor Himes and Mr. Nicol have both produced respectable negatives—a result which is very anomalous and inexplicable, when compared with the effects of nitrate of silver in place of the tannin.

We do not describe the above method for general practice, because we are not yet assured of the extent of its reliability.

CHAPTER IV.

EXPOSING, DEVELOPING, FIXING, AND INTENSIFYING THE PLATES.

It is universally admitted that the dry process requires a much longer exposure than the wet process; from our own experiments we make the deduction that this exposure, on an average, is at least six times longer with the former than with the latter. There seems to be a mania in photographers to aim rather to shorten the time of exposure than to get good results; and, owing to this morbid desire or aim, many tannin plates turn out to be so much trash. Let the operator, therefore, be thoroughly imbued with the idea that a tannin plate is slow in receiving the impression; but when once the impression is made, it can be developed. Furthermore, let him understand this fact, that an under-exposed tannin plate is *irremediable*, while an over-exposed tannin plate can be *controlled*, and the image developed accordingly.

There are two modes of development—the *acid development* and the *alkaline development*. Our preceding remarks refer to the ordinary acid developer. With the alkaline developer the time of exposure is about twice that with the wet process. Then why not abandon the acid developer at once, and adopt the alkaline developer in general practice?

Because the alkaline developer is apt to produce a sort of fogginess, which detracts from the beauty of the finished negative, and because many photographers as yet have failed to succeed with it. As a rule, we practice the acid development, and resort to the alkaline only in special cases where it is known that the exposure has been necessarily short.

Suppose you desire to take a negative of a public edifice, well lighted, and reflecting good actinic colors, and that the tannin plate has been quite recently prepared, the exposure may be at least one minute. A minute and a half, or even two minutes, in all probability, would be an advantage. For an ordinary landscape an exposure of about three minutes will, on an average, be right. The lens used is supposed to take the public edifice above mentioned by the wet process in about ten seconds.

We recollect instances where we gave an exposure of three minutes by the wet process, and this exposure was found requisite to obtain an impression; in such instances as these, twenty minutes or half an hour will not be too long an exposure with tannin plates; and yet we recollect very forcibly that at one time, in the infancy of our acquaintance with the tannin process, we attempted to obtain pictures on tannin plates in those localities with an exposure of at most two minutes, and became utterly disgusted with tannin. An exposure of twenty minutes may appear egregiously long to portrait photographers; but let them not be deterred from landscape photography before they have balanced accounts. With the wet process in the field, each negative will require, on an average, half an hour before it is finished, or in a condition to be carried from the field; with the dry process, the impression can be made, on an average, in ten minutes. It is evident, therefore, that more negatives can be taken on a tour by the dry than by the wet process, in a given time. The difference in favor of the wet process is, firstly, that the negatives can be examined before leaving the ground, and fresh ones taken if the first are defective; and, secondly, the negatives are, comparatively speaking, finished, while those by the dry process have to be developed at some future time. The above may be advantages on the side of the wet process, but their absence in the dry process can scarcely be called disadvantages.

RULES FOR EXPOSURE.

1. Let a minute or a minute and a half be the minimum exposure for a well-lighted object, such as buildings, ships, etc.
2. Give three minutes for a well-lighted landscape.
3. A quarter of an hour to twenty minutes will be required in deep ravines or shady groves.
4. When traveling on cars, and stepping out at the different stations to take views, expose in accordance with the above rules where it is possible ; where the exposures are necessarily shorter than the times above mentioned, mark the negatives with some sign by which you know that they are to be developed by the alkaline developer.
5. Affix on each negative a small ticket, upon which is written the time of exposure.

ACID DEVELOPMENT.

Pyrogallic acid is the developer used in the tannin process. Its action alone is much too energetic without the restraining influence of some other acid. Either acetic or citric acid may be used for this purpose. We have, therefore, two acid developers, either of which can be used. The color of the finished negative is different in the two cases ; with acetic acid the hue inclines more to the red than with citric acid, which has a tendency to produce a bluish tone.

TO DEVELOP WITH ACETO-PYROGALLIC ACID.

This method is the simplest of the two, because acetic acid is in the hands of all photographers. Make the solutions in stock bottles :

ACID PYROGALLIC.

No. 1.	Pyrogallic acid	18 grains.
	Acetic acid	1 ounce.
No. 2.	Nitrate of silver	30 grains.
	Distilled or rain water	1 ounce.
No. 3.	Acetic acid	1 ounce.

Place these bottles on a shelf in the dark room conveniently at hand for use. When a picture has to be developed, as, for instance, a stereoscopic plate, make the following solution:

Of No. 1	15 drops.
Rain or distilled water	3 drachms.
Of No. 2	4 drops.

Shake the mixture well and pour it upon the collodion film, after it has first been made uniformly moist by dipping the plate in a dish of clean water. If the picture flashes out rapidly, the exposure has been too long, in which case a few drops of No. 3 are to be added to the developer, to restrain its action. The picture is most successful when the action of the developer does not instantly appear, and after it does commence if the progress is slow. As soon as the picture is completely out, and the developer has become red, it will be necessary to make a fresh quantity, and proceed until the shadows are sufficiently intense. Avoid, as much as possible, rapidity of action in the developer, because rapid action is merely another mode of expression for heavy deposit, which is generally quite granular—a condition to be avoided. Well-exposed pictures have always, at this stage, a rich reddish tone when developed with the aceto-pyrogallic acid. The developer soon turns red if much silver is added, or too little acetic acid be used.

TO DEVELOP WITH CITRO-PYROGALLIC ACID.

This is the more general mode of developing a tannin plate of the two; for which purpose make the following stock solutions:

No. 1.	Pyrogallic acid	96 grains.
	Absolute alcohol	1 ounce.
	Ether	2 or 3 drops.

Five minims of this solution contain one grain of pyrogallic acid.

No. 2.	Nitrate of silver	10 grains.
	Citric acid	40 grains.
	Distilled water	1 ounce.

No. 3.	Citric acid	60 grains.
	Distilled water	1 ounce.

Moisten the film as before, by dipping the plate into a dish of clean water; then make the following mixture:

Distilled or rain water	3 drachms.
Of No. 1	2 drops.
Of No. 2	2 drops.

Shake the mixture and pour it upon the moistened film. If the action is slow, by reason of the inadequate exposure, add more of the alcoholic pyrogallic acid, and proceed pouring on and off until the picture is thoroughly out. On the contrary, if the action is too rapid, it must be restrained by the addition of a drop or two of No. 3.

Intensity is produced by the citro-nitrate of silver.

Owing to the volatility of pyrogallic acid in a concentrated solution of alcohol, it is preferable to use a more diluted solution, and not to prepare a large quantity at a time. For this purpose the following formulas are better adapted, and at the same time are more manageable in other respects:

No. 1.	Pyrogallic acid	30 grains.
	Alcohol	4 drachms.
	Water	4 drachms.

Sixteen minims of this solution contain one grain of pyrogallic acid. It will be necessary and convenient to have a drachm glass ready at hand for this measuring, and the following solutions:

No. 2.	Citric acid	2 drachms.
	Distilled or rain water	4 ounces.

Sixteen minims of this solution contain in like manner one grain of citric acid.

No. 3.	Nitrate of silver	10 grains.
	Rain or distilled water	1 ounce.
No. 4.	Distilled or rain water	1 pint.

If, for instance, a stereoscopic picture is to be developed, take an ounce vial and pour into it half an ounce of the distilled water, to this add five minims of No. 1, ten minims of No. 2, previously mixed with one or two drops of No. 3. Shake the mixture well and then pour it upon the moistened plate. If the image comes out slowly, add more pyrogallic acid; if there is a want of intensity, after the image appears, add more of No. 3; if there is a tendency to fogging, add more of No. 2, or wash the plate gently and flow it with the bromide solution previously recommended and used in preparing the tannin plates, and then proceed again with the developer. The full intensity can be brought out, after a little practice, before fixing; but we find it generally more convenient to re-intensify after the image has been fixed and well washed. The same solutions can be used as for the development to produce the desired effect, or the Selle's new intensifier may be employed. This solution produces a reddish brown negative, which prints well.

SELLE'S INTENSIFIER.

No. 1.	Sulphate of uranium . .	10 grains.
	Distilled or rain water .	1 ounce.
No. 2.	Ferridcyanide of potassium .	10 grains.
	Distilled or rain water .	1 ounce.

Take one drachm of each of these solutions, mix them well together, and flow the developed and well-washed plate with the mixture, the image will soon redden and assume sufficient intensity, which must be somewhat deeper than is finally required, because the shades become more transparent from the effect of the varnish.

Pyrogallic acid solution should always be filtered immediately before use, otherwise any particles of matter that may chance to be present, from retaining the acid in a more concentrated form even in the midst of the dilution, are apt to produce in the development irregularities that are exceedingly disagreeable after all the trouble that has been taken in the preparation of the plates.

If the prepared tannin plates have not received a substratum of albumen, gelatine, or gutta-percha, there is always, more or less, a tendency in the film to split up and peel off. To avoid this it has been recommended, and we always pursue the plan ourselves in the cases here comprehended, to flow the exposed plate just before development with a mixture of equal portions of alcohol and water, and then to gently wash off the apparent oily markings of this mixture with water before pouring on the developer. This alcoholic solution renders the film more porous, and retains it on the glass. With a substratum it is unnecessary.

During the development, if the solution becomes in any degree turbid, it is advisable to throw it away, and mix a fresh quantity; for the turbidity is owing to a decomposition, by which particles of silver, etc., are frequently deposited on the negative, giving it a granular appearance; and this same appearance is, in such a condition, reproduced on the paper print.

The development of a tannin picture by any of the acid solutions just given is sometimes protracted, especially when the plate has been under-exposed; in such a case as this it becomes tedious to retain the plate in the hand during so long an operation. For this purpose leveling stands are constructed, on which the plates may be placed and left with the developing solution upon it until the proper intensity has been attained.

A leveling stand may be constructed of two discs of thin wood and an axis between them, the combination having the appearance of a spool or bobbin. The upper disc is two inches in diameter, the lower four inches; the length of the axis four inches. A circle is turned in the lower disc three inches and a half from the centre, and three screws perforate this circle at points seven inches apart; the ends of the screws are filed flat.

The plate is placed upon the stand, and the developer is poured upon it; if the latter does not run off the plate, but is retained in an equal film upon its whole surface, the stand is level, and requires no adjustment; but if the developer flows toward one corner, the stand is not level, and must be adjusted by means of the screws. We will suppose the fluid on the plate accumulates right over one of the three screws, it is evident this side is lower; in order to raise it, turn round the screw forward until the adjustment is made, and the surface of the plate is horizontal.

By means of a number of leveling stands several negatives can be developed at the same time, by which means much time and labor are spared.

As the amateur or practical operator becomes more and more acquainted with landscape photography, certain forms of development will occur around the edges of trees, mountains, etc., in which there is an encroachment of the high lights around the edges, as if the light had been inflected or diffracted, that is, had not proceeded in straight lines, but had been broken around these corners and edges. This encroachment depends in a great measure upon the direction of the light; for if the sun be located in the hemisphere behind the camera, it seldom or ever occurs; but if in the opposite hemisphere, frequent examples of blurring or halation of the negative will be met with. But the position of the sun's rays is not the only cause of the trouble in question. A plate of glass has two reflecting surfaces; light impinging upon the first surface coincides by reflection with that which impinges on the collodion film; whereas, the rays which are reflected from the second surface and again impinge upon the collodion film do not fall upon the parts they passed through, and consequently give rise to the encroachment alluded to.

This sort of blurring is obviated in a great measure, if not totally, by rendering the rays reflected from the posterior surface of the plate non-actinic, which is effected by placing behind the plate during exposure a piece of orange-colored blotting paper, or other convenient material. The author finds a thin layer of the red sheet of rubber, such as is used by dentists for making artificial palates, etc., to be the best. Such a sheet can be pressed out very thin on a plate of glass, of the size of the stereoscopic plate, for instance, and thus kept ready for use to be placed in apposition with the back of the tannin plate when exposed. The rays of light, after penetrating the collodion film, impinge on this orange-colored film, whereby only orange-colored light is turned back upon the collodion film, and, being non-actinic, they make no impression.

FIXING SOLUTION FOR TANNIN NEGATIVES.

Hyposulphite of soda	5 ounces.
Water	10 ounces.

This solution can be used over and over again, the strength being kept up by the addition of fresh crystals when required. Great care must be taken to remove this salt from the film by washing thoroughly, first in rain water and then in a dilute solution of common salt, before the plates are submitted to the action of the intensifier or put away to dry.

ALKALINE DEVELOPMENT.

As soon as the operator is quite at home in all the manipulations of the acid development, he may try his hand at the alkaline development; for, although perhaps he may not wish to practice the latter mode in preference to the former, times will occur in which the latter will have to be resorted to in spite of every precaution to the contrary.

Some operators prefer the alkaline development; the majority, however, adhere to the old reliable process of aceto- or citro-pyrogallic acid. The time of exposure with this developer is much shorter than by the acid developer, but not so short as with the wet process. If by the wet process, with a given lens, diaphragm, and light, an exposure of four seconds will produce a given result, with a tannin plate and the alkaline developer the same result can be obtained in about ten or twelve seconds.

Prepare the following solutions:

DILUTE ALCOHOL.

No. 1.	Alcohol	2 ounces.
	Distilled or rain water .	2 ounces.

ALKALINE DEVELOPER.

No. 2.	Carbonate of ammonia	48 grains.
	Water	3 ounces.

One drachm of this solution contains two grains of the carbonate of ammonia.

PYROGALLIC ACID SOLUTION.

No. 3.	Pyrogallic acid	30 grains.
	Alcohol	4 drachms.
	Water	4 drachms.

Sixteen minims of this solution contain one grain of pyrogallic acid.

NITRATE OF SILVER SOLUTION.

No. 4.	Nitrate of silver	10 grains.
	Distilled or rain water	1 ounce.

SOLUTION OF CITRIC ACID.

No. 5.	Citric acid	2 drachms.
	Distilled or rain water	4 ounces.
No. 6.	Distilled or rain water	1 pint.

FIRST OPERATION.

As soon as the plate is removed from the holder, flow over the surface a sufficient quantity of the dilute alcohol No. 1, and then let the solution drain back again into the vial; afterward gently wash the film until the oily streaks disappear, and the water flows uniformly over the surface of the collodion.

SECOND OPERATION.

In a two-ounce vial mix one drachm of the alkaline solution No. 2 with seven drachms of water, and cover the plate with this mixture; now pour it back again into the vial, and add thereto five minims of the alcoholic solution of pyrogallic acid No. 3. Shake the mixture well up and pour it upon the plate. The picture will soon begin to appear, if the exposure has been long enough. If it is slow in appearing, add two or three minims more of No. 3. If by this addition the picture does not appear in a minute or less, the exposure has been too short, and, although eventually a picture may be brought out, it will fail to contain the requisite amount of detail to entitle it to be called satisfactory; it will be a black and white picture.

But we will suppose the picture begins to appear almost immediately, and proceeds gradually, receiving more and more detail, until finally it is perfect in this respect, although far from being intense; in fact, at this stage, it is a faint *reddish colored* negative, perfect in all its parts, and requiring only intensification. Such is the normal result; but the picture may flash out red almost immediately. In this case the exposure has been too long, and to remedy this, wash off the developer immediately, and use only the acid developer in the subsequent treatment. With the normal condition proceed as follows:

THIRD OPERATION.

Pour off the alkaline developer and wash the plate gently, and then flow it with the following solution, in order to remove all alkalinity:

Solution of citric acid No. 5 .	30 minims.
Water	3 drachms.

Pour this solution away, and flow the plate with the following:

Distilled water . .	4 drachms.	
Pyrogallic acid, No. 3	5 minims.	
Citric acid, No. 5 .	10 minims.	previously mixed.
Nit. of silver, No. 4	2 to 3 minims.	

Shake the mixture well, and proceed exactly in the same manner as with the acid developer, as already described. The washing, fixing, etc., from this stage, are also precisely the same.

Cyanide of potassium in solution is not to be recommended as a fixing agent, because it soon penetrates the collodion film, and then seems to disorganize the stratum of albumen or gelatine beneath it, and to produce bubbles and other irregularities in the film that deteriorate the picture. But if the tannin picture is somewhat fogged, it may be clarified in a great measure, and rendered tolerably passable, in the following manner, in which cyanide of potassium is brought into play:

CLARIFYING A TANNIN NEGATIVE.

Make the following solutions:

TINCTURE OF IODINE.

No. 1.	Iodine	30 grains.
	Alcohol	1 ounce.

CYANIDE OF POTASSIUM SOLUTION.

No. 2.	Cyanide of potassium.	1 drachm.
	Rain-water	4 ounces.

If the film is but slightly fogged, flow it with 4 drachms of water containing 20 minims of tincture of iodine for a short time. This dilute solution of iodine may be used several times in succession, until its color has almost entirely vanished. Wash the film, and flow over it a sufficient quantity of the solution of cyanide of potassium. This is very rapid in its action on the iodide of silver, and soon clarifies the negative. With cautious manipulation, such an expedient may be resorted to with advantage; but in general it produces harsh negatives in which the finest markings have been destroyed, and nothing but lights and shades remain in stern contrast, without all intermediate gradation to give harmony to the subject. A stronger solution of the tincture of iodine is necessary to remove stains from the corners of negatives; even that in the undiluted form of No. 1 will not be too strong. Care, however, must be taken that it does not flow any further upon the negative than is requisite by the extent of the stain; the place is then washed and treated with the cyanide solution, as before.

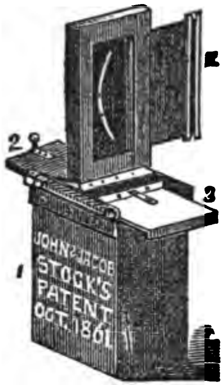
CHAPTER V.

CHANGING BOXES FOR LANDSCAPE PHOTOGRAPHY.

The tourist having now learned how to prepare and develop dry plates, is desirous of making practical application of his knowledge. But now arises in his mind, for the first time, probably, a difficulty regarding the transportation of the dry plates, and the separation of a single plate from the package, without endangering the sensitiveness of the rest. If the plates have been well packed, as already described in a previous chapter, they will bear change of locality to any extent, from the meridian, passing through the Cape of Good Hope, right round the earth on a parallel of latitude to the place of beginning, as long as light is not admitted into the interior. A plate, therefore, can be separated from the rest in a dark room; this expedient is very inconvenient in traveling, and frequently impracticable. Plans, consequently, have been devised for the manufacture of what are denominated changing boxes, which are so constructed as to contain a given number of dry plates, and to allow a single plate to be withdrawn from its receptacle in the changing box, and transferred, without ever coming into the light, into the plate-holder for exposure; and, after exposure, to be transferred back again into its receptacle in the changing box. Up to the present time we have been using a changing box of our own invention and construction, and we have found it, like all the wonderful things we imagine, concoct from ideas, and put together ourselves, wonderfully appropriate and everlastingly strong. There is no end to the wear and tear it will endure. The model locomotive we made in 1832, christened "Fury," is still a vigorous little tug; the French bedstead, the chest of drawers, the eccentric chuck, the slide rest, the overhead motion, the spinning-jenny, the fringe-loom, and hundreds of other ebullitions of the untired brain and the never-flagging hand, as they meet our view at every moment, attest to the permanency of home-fabrications. But such fabrications are not always the best; and if they were, we have no time to work mechanically for our neighbors, unless it be to open a gate for our betters to drive through.

Our own changing box, as previously observed, is very appropriate for the ends in view, and very strong; it will contain twenty-five dry plates, each of which can be taken out and placed in the plate-holder, and again replaced in its former position, or elsewhere, without any access of light. The operation, too, is easy. But the box is somewhat cumbersome. It seems to strike us forcibly that Nelson Wright, Esq., of New York, who is the sole proprietor of John and Jacob Stock's patent changing box for dry plates, must either have seen or heard of our conception and construction; he sent us one of his patent boxes, which we placed in juxta-position with our own. Imagine Barnum's giant and Tom Thumb walking arm in arm together, or Mount Etna and a funeral mound collocated side by side; such is the contrast between the two boxes. We have put away our own invention for awhile, and have lately been experimenting with the new comer. We must acknowledge (and we certainly at the beginning were determined not to make any such admission) that the new changing box is very appropriate, very strong, and *very compact;* it performs all that it promises. All the paraphernalia of a photographic tour may now be carried with ease in two small packages, one for either hand; the camera and holder in one hand, and the changing box and tripod in the other. Such an arrangement is truly a *multum in parvo*, a concentration of all the separate states in a unity, as it should be.

DESCRIPTION OF THE PATENT DRY PLATE BOX AND SHIELD.



As the name implies, there are two parts in this arrangement, the one for containing a given number of dry plates, protected against the light; and the other the holder or shield, for exposing each plate when required.

The accompanying figure represents the changing box, surmounted by the plate-holder, which slides endwise in a groove on the top of the second lid of the box. The changing box itself is in the form of a rectangular prism, containing on two opposite sides, within, twelve or eighteen grooves for the reception of so many dry plates, and is closed on the top by means of two doors sliding in opposite directions. On one side at the top is found a rack furnished with as many dents as the box contains plates; this rack of brass is pressed upward by means of a spring beneath against a projecting tooth or cog fitted upon the side of the upper sliding door. On this upper slide is fixed a brass groove, into which the end of the plate-holder slides, and as this end slides into its place it opens a brass door, beneath which closes an incision immediately above a dry plate; an incision similar to the preceding, which is sufficiently large to allow a dry plate to slip easily through, is found on the end of the plate-holder, and coincides in position with the former incision. By pressing down the spring rack, the upper plate may be slidden so that the tooth may catch in each indentation, which thus brings the incision successively over each dry plate beneath. But the plate beneath can not escape until the under slide is drawn out as far as it can be drawn, and until a spring on its upper surface rises and stops its motion backward. When in this position the passage for a dry plate is clear ; and by inverting the box with the plate-holder on its end, the dry plate immediately above the open incision will fall down and through these incisions into the plate-holder beneath, where it is secured by means of a cross-bar on the back of the plate-holder, which presses down a door that closes up the incision at the end, and pushes the plate firmly forward upon the ledges of the groove in which it slides. As soon as this door is closed and the changing box inverted, or turned right side up, the spring on the under slide on the top of the changing box is pressed down, which allows the under slide to be pushed back into its place so as to close up all avenues for light to enter. When this is done the plate-holder is removed from its connection with the changing box, and is ready to be transferred to the camera for exposure. After exposure the connection is again made, the under slide again drawn out to its extremity, and the exposed plate is allowed to drop down into its former position. The same order is observed with each plate.

In the figure the under slide is marked 3, the upper one 2, and the plate box 1.

The collodion film of each plate looks always in the same direction ; toward the number 3.

To fill the box with plates the screw at the end 2 is removed, the rack is pressed down, and the two slides are drawn out.

We have seen other forms of changing boxes, but we give preference to this one, by reason of its compact form, its superior adaptability for the purposes in view, and the absence of any liability to get out of order from common wear and tear.

CHAPTER VI.

PREPARATION OF TRANSPARENT POSITIVES BY THE TANNIN PROCESS, OR CONTACT-PRINTING ON GLASS.

CONTACT-PRINTING on glass is one of the most attractive applications of photography; it is attractive because the results are among the finest specimens of the art; it is attractive, too, because the operation can be performed at all seasons of the year, and by artificial as well as solar light; it is an amusement in winter, and a recreatiion during the evenings after business. It is, finally, an easy operation.

Negatives are required in this mode of printing of the same nature and perfection as for printing on paper, with this single condition, an indispensable condition, that the negative plate be *perfectly flat or horizontal*. *Ground plate-glass*, must, therefore, be the receptacle of the negative film for all operations of printing on glass by the dry process.

We need scarcely remark, that negatives for this sort of printing must be clear, bright, vigorous, full of detail, and, if we may be allowed to be pleonastic, totally free from fogging; for these are the conditions of every good negative, and without them no good print can be obtained either on paper or glass.

The varnish with which such negatives are coated must be quite free from all particles of dust or other substance, which, when dry upon the film, might cause inequalities that would prevent perfect contact between the negative and the positive films. The edges, too, of the negative, on which the collodion and varnish have passed off from the plate, are frequently elevated by a ridge of one or both these media ; this ridge will also prevent contact between the plates, and must be removed by cutting off a slip of glass on one side and end by means of the diamond, or by abrading the elevated part by means of a pen-knife. Perfect contact is absolutely required between the two films ; such precautions, therefore, are also absolutely required in the preparation of the negative plates. The same conditions are also necessary in the prepared tannin plates ; but here no varnish has been used, and, if a substratum of albumen has been employed, the elevated ridges can easily be removed by abrasion or the diamond, without any detriment to the film afterward ; but if the edges of the tannin plate have alone been varnished, it is evident that the removal of the ridge, either by scratching off or by cutting with the diamond, would expose the film to slip off in the subsequent treatment with the developer. The best precaution, consequently, is to use rather a thin collodion in the preparation of the tannin plates, and to obviate the ridges in question by a skillful manipulation.

The ordinary printing frame is employed for this sort of printing ; but do not forget this difference in its employment : the glass to receive the print is *never brought out into the light* in order to be placed upon the negative, but is laid upon the negative in the dark room.

Supposing, then, all is ready for printing, you proceed as follows :

Lay the printing frame upon a *flat* piece of wood, sufficiently large to exclude all access of light to the negative as long as the frame thus lies in apposition with the board. Open the door and place the negative on the supporting flanges, the film being upward ; dust the film with a broad camel's hair pencil, as also the tannin film, very gently, if it contain any small particles, The tannin plate is next laid down upon the negative, the two films being in contact; this operation must be carefully performed, so as to avoid all friction which might injure the tannin film. Place, finally, upon the back of the tannin plate a piece of soft yellow, red, or orange-colored cloth, and close the door with the pressure springs. The orange-colored cloth is intended to destroy all effects of reflection of actinic light from the posterior surface of the tannin plate.

The next operation is to expose the plate either to solar or artificial light. Carry the frame, supported on the thin board, out of the dark room into the light, as for instance, to an open door looking to the north, where diffused light alone can reach, because direct solar light is much too powerful and unmanageable. Now lift up the printing frame from the board and expose the negative to the sky for half a second, a second, or more, according to the brightness of the light or the density of the negative. Probably an exposure for one second will be sufficient. You have to learn the length of exposure required by exposing a plate or two experimentally; afterward you can judge pretty accurately as to the exact length of exposure required under given circumstances. The printing frame is again laid upon the thin board, and carried back again into the dark room.

The treatment of the plate from this point is in every respect the same as already described; the plate is simply a tannin plate already exposed and ready for development.

But the exposure can be effected in the evening and by means of gaslight, magnesium light, or the light from a piece of burning phosphorus. Where gaslight is available, this is by far the cheapest, the easiest, and most pleasant to operate with; and because it is not so rapid in its action, the operation is much more manageable than by solar diffused light, and consequently the operator produces better results with such an exposure.

The gaslight for such work is better when it issues from an argand burner, and is surrounded by a thin ground glass or milk-white globe or shade. This arrangement makes the light uniform. The negative is exposed to such a light in such a way and on such a side or position where there is no object to produce shadows. The length of time to give the exposure has to be learned by experience; begin with eight or ten seconds, and try a few plates by way of experiment. From the fact that any amount of exposure can be given without the slightest detriment to the picture, the acid development is always to be recommended in preference to the alkaline development.

The mode of operating with either a magnesium or a phosphorus light is in all respects the same as with a gaslight, as regards the exposure; but the production of the light, so as to yield the best effects, depends upon the substance used. Magnesium wire or coils and magnesium lamps can be obtained already in the very best conditions for producing the effect required. As regards phosphorus, few have ever used it. We, probably, were the first to recommend its use, more as a curiosity than anything else. A small piece of phosphorus of the size of a pea is lighted on a piece of brick, and while burning the negative is exposed. Such a piece will generally burn long enough to produce the requisite actinic effect. The cloud of vapor arising from the oxidation of the phosphorus diminishes or clouds the brilliancy of the flame; this can be remedied by waving a handkerchief in such a direction as to produce a gentle draft of air, so as to drive the phosphoric vapor away from the exposed plate.

We have also obtained very good results with a kerosene lamp, the brilliant flame being covered, as was the case with the gas flame, with a ground glass shade or globe. This being the case, it is evident that, for practical operations in printing on glass by dry plates, either gaslight or kerosene light will be the most convenient and the least expensive.

To print stereoscopic transparent positives, extra instruction has to be given. In the ordinary negative, every part of the image is inverted, right is left, and up is down; but the effect of contact-printing, either on glass or paper, rectifies this inversion, and places the figure in its right position. This rectification in the stereograph is also complete in regard to each picture singly, but the right-hand picture by printing is transferred to the left side, and *vice versa.* From this fact it is evident that a common stereoscopic negative can not be used for such work. How, then, are we to proceed?

There are two ways of proceeding in order to put the negative in a right position. They are as follows:

FIRST METHOD.

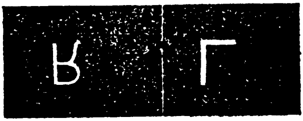
Cut the ordinary stereoscopic negative in two through the median line. Cut off from the right side of the right-hand picture, and from the left of the left-hand picture, a slip of glass, so as to make either negative of the same size, and to contain the same amount of detail; a slip of glass may also be cut off from the top and bottom of either negative, so as to reduce them at once to the regular stereoscopic size. Having made these excisions, invert the negatives, and place the right-hand picture on the left side, and *vice versa,* and bring the middle edges into contact, and the top and bottom edges into coincidence. Fix them in their position, on a piece of well-cleaned glass, by cementing small pieces of glass above, below, and on either side, so as to hold them from changing their position. They are now in a condition to be printed from.

SECOND METHOD.

The other method of preparing a stereoscopic negative suitable for contact-printing, is somewhat circuitous, consisting, first, in producing a transparent positive of the negative, by means of the camera and *two* lenses, making use of the wet process, and then obtaining a negative from the positive (in which all lateral inversion has been removed) by means of a camera and a *single* lens. This produces a negative in the right condition. We will now describe minutely the two operations; they require great nicety of manipulation, and are very instructive.

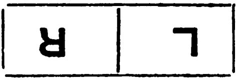
We suppose the reader is already in possession of a copying camera, which consists, or may consist, of two cameras attached firmly together endwise, to one of which is screwed a lens or a pair of lenses, as circumstances require. The two ground glasses are placed four times the focal length of the lens or lenses apart, and at equal distances from the lens, etc. The negative to be copied is placed in the position of one of the ground glasses, and the sensitized plate is placed in that of the other. The compound camera is raised and inclined, so as to receive the light from a white cloud or the illumined sky through the negative.

For the operation in question there are two steroscopic lenses fixed in the end of one of the cameras. The negative is turned wrong side up, and the film looks toward the lenses. The operation of focusing is effected by sliding backward and forward the body of that camera which is to contain the sensitized plate. When the image on the ground glass is sharp and everywhere well defined, measure the size of the image on the ground glass and compare it with that on the negative; if the two coincide in magnitude, every thing is now adjusted; but if the image is larger on the ground glass, draw *out* the negative slightly and push *in* the ground glass, until the desired effect is produced. When the equi-distant foci are once found, they are marked on the two cameras for future observation. A copy is now taken. The negative as it stands in the camera, with the collodion film looking toward the lenses, has the following appearance, where **R** represents the right side picture and **L** the left picture, both facing the observer on the surface of glass nearest the eyes.



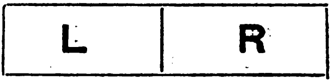
Negative film upward.

The effect produced by copying with the two boxes is, firstly, to produce a transparent positive; secondly, to invert each picture laterally, so that the appearance on the film of the positive, still facing the spectator, is as follows:



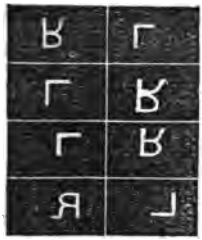
Positive film upward.

The two lenses are now removed, and a single orthoscopic lens placed in the middle in their stead; and the transparent positive takes the place of the negative in the front camera facing the lens, while a sensitized plate is placed in the shield of the camera. An impression is now taken, which will be a negative, in a proper condition for contact-printing by the dry process. The position of the two images on the film behind the negative, or as it would lie on paper or glass to receive the rays of light for an impression would be as follows:



in which it is evident that the right picture is on the right side, and the left picture on the left side, and not inverted vertically, this is the correct position; but it will be observed, that the impression by both methods are on the front of the glasses, which, when mounted, will require two extra plates, a translucent or ground-glass behind and a transparent one in front. These glasses, as well as the negative plate, are as thin as possible and compatible, nevertheless, together they appear voluminous and heavy. To avoid this bulk and weight we devise means by which the positive picture shall be beneath the plate, and still in its true position as to right and left. This can be effected either from the cut or uncut negative.

Taking the cut negative, in which there has been a transposition of the two pictures, as already described for the first method, place it in the printing frame and take an impression with a dry plate, which will be a positive; from this, the film looking outward, a negative is taken by a single lens by the wet process. The resulting negative will produce, by contact, a positive print, which will be in the right position on the back of the plate; the plate itself, therefore protects the film from injury in front, while the ground glass protects it behind. The different forms which the original negative undergoes are represented by the following figure:



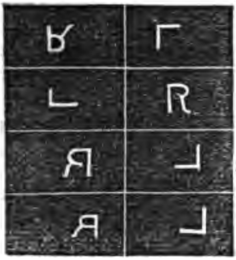
Original negative, film upward, or in front of the plate.

Images transposed by cutting the plate in two, film in front, etc.

Positive by contact, film behind the plate.

Negative by one lens, film behind the plate.

A second method to accomplish the same object with the cut and transposed original negative is as follows: Take a positive, by the wet process, from the cut and transposed original negative, the film being turned away from the lens; from this positive, when varnished, and by means of a dry tannin plate, take a negative; this negative will be in a proper condition, and the pictures will be similarly located as by the preceding method. The figures and transformations will stand as indicated below:



Original negative, film upward.

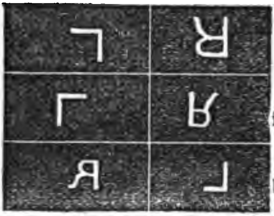
Images transposed, film looking outward.

Positive taken with a single lens, film in front.

Negative by contact-printing, film behind.

But the same result can be obtained more easily without cutting the glass; more easily, because the glass is not required to be cut. There are two methods by which this end can be obtained.

In the first place let the film of the original negative look outward from the camera, then take a positive by means of two lenses with the wet process; place the positive in the shield, the film looking inward, and take a negative with one lens. The various configurations are as here indicated below:



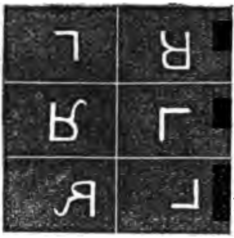
Original film looking outward.

Positive by means of two lenses, film in front.

Negative by means of one lens, film behind.

Secondly, let the film of the original negative be outward, as before, and take a transparent positive by the wet process by means of one lens.

Place this positive in the shield, the film looking inward, and by means of two lenses and the wet process take a negative; it will be exactly similar to the preceding, as will appear from the configurations:



Film of original negative looking outward.

Positive by means of one lens, film in front.

Negative by means of two lenses, film behind.

A careful attention to the preceding stereoscopic forms, and the accompanying text, will enable any photographer to produce stereoscopic negatives endowed with the necessary conditions for the preparation of glass transparencies on tannin plates, the film being either in front of the glass or behind it, as circumstances require. Although this delightful branch of photography is far from being exhausted, we are afraid to proceed any further, lest the patience of our readers become exhausted. We shall, therefore, proceed at once to the next chapter; for we suppose the mode of mounting stereoscopic transparencies requires no description or explanation.

CHAPTER VII.

OPAL OR PORCELAIN PICTURES AND PHOTO-MINIATURES BY THE DRY PROCESS.

The preparation of photographs on opal or porcelain plates is coming daily more and more into vogue; and since these beautiful pictures can be prepared quite successfully on dry plates, it becomes our duty to give succinct methods of performing the operation.

There are several ways of accomplishing the task; but we will limit ourselves to two, which, by practice, are known to be successful; the one by means of tannin plates, and the other by the collodio-chloride process of G. Wharton Simpson.

OPAL PICTURES ON TANNIN PLATES.

Porcelain plates with ground and flat surfaces are alone to be employed in this department, if the pictures are to be obtained by contact-printing; if by means of the conjugate copying camera, the ordinary porcelain plate may be used instead. In either case the plates, as usual, are first thoroughly cleaned and polished, and then one surface is flowed with pure water, and afterward with the albumen solution previously described. In all other respects the plates undergo the same treatment as already given in complete detail while describing the preparation of a tannin plate.

The ordinary printing frame can be used in making these glass prints. The negative and dry tannin plate are placed in contact, and the dark slide behind is closed; and either a mat or vignette is placed over the negative in order to circumscribe the picture. All the precautions required in the preparation of a porcelain picture must be observed here; thus, the hair and other parts of the negative may be too transparent, whereby these parts would be much sooner printed than the adjoining half tints or dark shades. To avoid this inequality paper forms are cut out which cover up the lightest or most transparent parts, but allow the light to pass without interruption through the shades and half tones. A piece of tissue paper may cover the complete opening. The length of the exposure has to be learned by practice; try a few seconds with a free exposure to a white cloud; without the paper moderators less time will effect the purpose.

Either the acid or alkaline developer may be employed. Both in the preparation of the plates and in the process of development, fixing, intensifying, and toning, make use of every precaution to avoid any cause that would produce stains. Develop until the picture is thoroughly brought out; but, above all things, keep the lights quite clear, in fact, stop in all cases before the slightest fogs set in. The citro-pyrogallic acid is to be preferred as a developer.

Wash and fix the print in a solution of hypo-sulphite of soda, and again thoroughly wash.

Now examine the print and remove all particles of extraneous matter from the picture, by means of the sharp point of a stile or penknife blade, and wash out the stains from the face and corners of the plate by treating them first with a solution of tincture of iodine in water, and then with dilute cyanide of potassium. Be careful that the tincture is not poured on any part of the picture, otherwise the markings of the photograph will suffer. The most persistent stain may thus be removed:

TONING OF THE OPAL TANNIN PICTURE.

The picture being bright, sharp, and in all other respects but color satisfactory, the next operation is to communicate to it the desired tone. For this purpose make the following solutions:

GOLD SOLUTION.

No. 1.	Terchloride of gold (neutralized with carbonate of soda) .	1 grain.
	Distilled or rain water . .	2 ounces.

MERCURY SOLUTION.

No. 1.	Of a saturated solution of bichloride of mercury . .	1 drachm.
	Citric acid	2 grains.
	Distilled or rain water . .	10 ounces.

The film being well washed and still moist, flow it with a sufficient quantity of the gold solution, and watch the change of color in the film. This color will be a slate blue at a certain point, when an apparent retrograde action sets in, and the intensity becomes gradually less. Wash the print as soon as you think the tone begins to change backward. Now flow over the film a drachm or two of the mercury solution. This makes the shades and details of the print bright, more black, and warmer than before. In fine, by this proceeding the picture will be so far complete.

A dilute solution of nitric acid—20 drops to 4 drachms of water—is sometimes used for removing stains upon the film, and thus purifying the lights or whites. Finally, the film is washed, dried, colored, and varnished.

PORCELAIN PICTURES BY THE COLLODIO-CHLORIDE PROCESS—SIMPSONTYPE.

We can suggest no improvement to the process practiced by our friend, H. T. Martin, Esq., in the preparation of porcelain pictures on opal glass.

The porcelain plates are ground flat on one surface, and then flowed with the albumen solution already described, and put away to dry.

SENSITIVE COLLODION.

Ether	1 ounce.
Alcohol	1 ounce.
Pyroxyline	12 grains (more or less, as required).
Chloride of calcium .	3 grains.
Nitrate of silver . . .	16 grains.
Citric acid	4 grains.
Castor-oil	4 drops.

The cotton is first divided into small tufts and then immersed in the ether. The nitrate of silver is pulverized and dissolved in the smallest possible quantity of water ; to this solution add two or three drachms of the alcohol, and shake the mixture intimately and put aside for a moment.

Add the remaining part of the alcohol to the mixture of ether and pyroxyline, and shake the mixture until the cotton is dissolved. Pulverize the chloride of calcium and dissolve it in this plain collodion.

Carry these two solutions into the dark room, and add the former drop by drop to the latter, shaking the mixture well after each addition. An *emulsion* is thus formed by the double decomposition of the two salts in contact—nitrate of silver and chloride of calcium. The fine powder of chloride of silver, intimately diffused through the mixture, gives rise to this emulsion, which, with the collodion, forms the sensitizing vehicle ; it is, in fine, the sensitive collodion.

Finally, add the four drops of castor-oil, and set the mixture aside for a day or two to settle. By the end of this time particles of undissolved cotton and other matter will have subsided. The fine emulsion is decanted for use. It must be preserved in the dark room and kept quite excluded from the light.

The castor-oil is introduced in order to permit the process of printing to be carried on to any extent without any risk of bronzing.

Coat the dry albumenized plates with the emulsion or sensitized collodion, and allow the film to dry completely. When dry the plates are fumed for about three minutes at the ordinary temperature; in the heat of summer less fuming will be sufficient. After this the plates are taken out from the fuming chamber and exposed to the air for a few minutes. They are now ready for exposure.

The negative may be such a one as is used for printing on albumen paper, sharp and vigorous. The two plates, the negative and the sensitive plate, are placed with their two films in perfect contact by means of Shive's opal printing frames, and then exposed to the light of the sun. This frame allows the operator to inspect the printing as it proceeds. Print *deeper* than is ultimately required, because the intensity is somewhat diminished in the subsequent operations.

TONING THE PORCELAIN PICTURE.

The plate is gently washed, in order to remove all free nitrate of silver; it is then immersed in an old toning bath, or flowed with a dilute solution of chloride of gold, as already described in the preparation of porcelain pictures on tannin plates, and afterward with the acid and dilute solution of bi-chloride of mercury. This latter mode will be found an advantage.

The plate is now carefully washed, and fixed in a bath of hypo-sulphite of soda as follows:

Hypo-sulphite of soda	1 ounce.
Water	10 ounces.

It is finally washed thoroughly; all stains are then removed by methods already given, and the plate is again washed and dried. The picture is now ready for coloring and varnishing.

THE PREPARATION OF PHOTO-MICROGRAPHS BY MEANS OF TANNIN PLATES.

The camera for taking photo-micrographs is furnished with two lenses, one for taking the photograph on the sensitized plate, and the other on the opposite side of the ground-glass, for focusing the image. The lens proper must be well corrected, and have a focal length of a quarter of an inch or more. The objectives made by Grunow for his microscopes are very well adapted for the preparation of photo-micrographs. An ordinary French objective, whose focal length is one inch, or still better a Grunow's one-inch objective will be suitable for a focusing lens. Both these lenses are fixed perpendicular on opposite sides to the ground-glass, and the line of collimation of the two lenses is coincident. By means of a rack and pinion motion they can be brought nearer to the glass, or made to recede from the glass. There is a place in front of the lens proper to receive the picture to be copied; the shield which holds this picture is vertical, and its plane parallel with the ground-glass.

We have spoken of the ground-glass; we mean, however, the piece of polished glass which takes its place; for every ground surface, when viewed by the focusing glass, would exhibit ridges, cavities, and mountains of large dimensions, upon which no microscopic picture could possibly be discerned. The surface of a piece of plate-glass is sufficiently rough for this delicate operation.

The first step to be taken is to take out this piece of plate-glass, to polish it, and then scatter a little dust on its surface, by shaking a book from the book-shelf close by it. Although no dust can be seen by the naked eye, you will find sufficient has been deposited upon the glass when it is examined carefully with the back objective. Now bring the front lens into its place, so that it illumines a small circle of the plate-glass when it is pointed to the sun's rays; whether direct or after reflection. We know that the line of collimation, or the axis of the two lenses coincide, from the fact that the illuminated circle of light produced by the front lens is visible by the focusing glass.

The second step is to adjust the focusing glass itself to focus. This is accomplished by causing the lens to approach or recede from the plate of glass until the fine particles of dust on the surface next to the front lens are perfectly well defined. This adjustment must be made with the utmost accuracy. It is evident from this arrangement, that if there were a picture produced by the front lens on the surface containing the dust, it would now be magnified by the focusing lens, and thus easily distinguishable.

The third step is to place the negative of the picture, photograph, or engraving to be copied, in its shield before the front lens, and to illumine this with the bright rays of sunlight, and afterward to obtain an image of this picture on the plate of glass. This is done by moving the lens to or from the glass until the picture is quite sharp and well defined.

These photo-micrographic cameras are generally so constructed as to take a number of photographs on the same plates. This is effected by sliding the plate-holder, by means of a graduated rack and spring eight motions, for instance, horizontally, and vertically by the same means through three motions. By such an arrangement twenty-four photographs can be taken on the same plate. The slip of glass to receive these minute photographs is very thin. It is treated in all respects like any other tannin plate, by coating it first with albumen, then with collodion, silver solution, and tannin. It is afterward dried, when it is ready for the exposure. A dry plate is much superior to a wet plate for this purpose, because it allows a large number of photographs to be taken on the same plate, which could not be effected by the wet process, from the drying of the film. The development, fixing, toning, etc., do not vary in any point from what has already been minutely explained. But the operator will need a pair of very powerful spectacles to watch the development, etc.

When the transparent positive is complete and dry, it is divided up by a diamond into separate small pictures, each of which is afterward mounted on the end of a Stanhope lens made for the purpose. The slip of glass containing the picture is cemented to the end of the lens by a small particle of Canada balsam, which melts by heat; the picture is laid upon the melted balsam, which, on cooling, causes the glass to adhere with great firmness. The color and transparency of the balsam are indistinguishable from the substance of the Stanhope lens. Such photo-micrographs, which are too small for the naked eye, may contain a copy of all the illustrious generals of our country, each one when magnified by the lens being of a size equal to that of a common card-picture. When well photographed, such productions seldom fail to produce the liveliest pleasure and excite wonder. They are indeed, although toys, charming productions.

CHAPTER VIII.

DRY AND WET PLATES REQUIRING NO SILVER BATH; OR, NEGATIVE PROCESSES WITH COLLODIO-BROMIDE OF SILVER.

The processes presented in this chapter we have not put to a thorough test ourselves; we have simply tried them and obtained pictures by them, but these were not so intense as we should wish them. The want of intensity, probably, was owing to some omission or neglect on our part, for the author of these processes, B. J. Sayce, says he has experimented upon upward of two hundred plates without making use of a silver bath, and always with "unvarying certainty and cleanliness, accompanied by a considerable saving of labor, time, and expense in the preparation of the negatives."

PREPARATION OF THE COLLODION.

The collodion recommended by Mr. Sayce, and which he has used for now upward of two years and a half, is prepared as follows:

Bromide of cadmium . . .	60 grains.
Bromide of ammonium . .	20 grains.
Pyroxyline	60 grains.
Ether	5 ounces.
Alcohol	5 ounces.

Prepare this plain collodion in the above proportions, in any quantity desired, and put it aside for a number of days to settle; then decant, or filter when required for use.

Now, take of nitrate of silver, in crystals, 120 grains, and reduce the salt to an impalpable powder in a mortar; finally, dissolve it in the smallest quantity of water, and mix with the above quantity of collodion, in a dark room, stirring the mixture all the while as the silver solution is poured into the collodion. The mixture is then shaken up intimately, and put in a dark cupboard to settle.

In the course of an hour or two the clear or fine emulsion on the upper portion is decanted off and is ready for use.

WET PROCESS WITH THE COLLODIO-BROMIDE OF SILVER.

The edges of the plates to be used are first varnished either with a solution of one grain of india-rubber dissolved in one ounce of benzine, or with the albumen solution recommended in the previous chapters for giving to tannin plates a substratum previous to the collodion film. A safer plan will be to use the substratum as recommended by us, and when the plates are dry, to flow them with the collodio-bromide in the usual way. As soon as the film has set sufficiently, the plate is placed in a dish of water until the greasy appearance has vanished. Warm water is preferable, because it is quicker in its action, and the heat renders the film more sensitive. When the water flows freely over the film, the plate is withdrawn from the dish or bath, and allowed to drain a moment or two; the back is then wiped with a clean cloth; and the plate is inverted in the plate-holder and exposed. The exposure is somewhat longer than that required by the ordinary wet process.

DEVELOPMENT OF THE COLLODIO-BROMIDE FILM.

Take the plate from its shield in the dark room, and moisten the film with a little water,

DEVELOPER.

Proto-sulphate of iron . . .	100 grains.
Glacial acetic acid . . .	100 grains.
Water	4 ounces.

To three drachms of this solution, add two drops of a solution of nitrate of silver, containing twenty grains to the ounce of distilled water.

The image appears quickly, and in every respect similar to that produced by a negative according to the ordinary wet collodion process.

The picture is afterward intensified by any of the methods already known.

FIXING THE IMAGE.

Prepare a solution of cyanide of potassium as follows:

Cyanide of potassium . . .	100 grains.
Water	5 ounces.

Immerse the washed plate in this solution, which will soon dissolve off the unaffected bromide of silver. When the substratum is albumen, it is our opinion that the hyposulphite fixing solution will be preferable.

DRY PROCESS WITH THE COLLODIO-BROMIDE OF SILVER.

The plates are previously prepared, either with an india-rubber solution round the edges, or with an albumen solution, as recommended in the preceding wet process. Each plate is then coated in the dark room with the collodio-bromide, and, when the film has set sufficiently, it is immersed in a dish or pail of water; in this way proceed with all the plates.

Having a dish filled with hot water, as hot as the hand can bear, take out each plate in rotation and immerse it in the bath for about thirty seconds, and afterward in the tannin solution, containing 15 grains to the ounce of water, well filtered, or in the following solution, which Mr. Sayce finds superior to the preceding :

Tannin	100 grains.
Gallic acid	50 grains.
Water	10 ounces.
Grape sugar	50 grains.
Alcohol	100 minims.

Dissolve the tannin in one portion of the water and filter ; dissolve the gallic acid by heat in another portion, and, when filtered, mix it with the tannin ; then add the grape sugar and filter once more ; finally, the alcohol is added, and the bath is ready for use.

If the plate is allowed to remain in the above solution for three minutes, after a proper exposure, very little or no intensification at all is necessary.

After immersion in the tannin bath, each plate is taken out, allowed to drain, and then dried evenly and quickly in any convenient and suitable manner. The steam chamber recommended in a previous chapter, may be used here with advantage.

Mr. Sayce asserts that the exposure of a collodio-bromide plate is one half shorter than that required by a bromo-iodized plate.

DEVELOPMENT OF THE COLLODIO-BROMIDE PLATE.

Prepare the following solutions :

No. 1.	Alcohol	2 ounces.
	Distilled or rain water .	2 ounces.
No. 2.	Carbonate of ammonia .	40 grains.
	Distilled or rain water .	20 ounces.
No. 3.	Pyrogallic acid	96 grains.
	Absolute alcohol . .	1 ounce.
No. 4.	Bromide of potassium . .	40 grains.
	Distilled or rain water .	4 ounces.

No. 5.	Nitrate of silver	30 grains.
	Citric acid	15 grains.
	Distilled or rain water	1 ounce.

Pour a sufficient quantity of No. 1 upon the exposed film, so as to cover it, and then return it into the bottle for future use. Then place the plate in a dish of clean water and move it about gently until the oily appearance has vanished. Now prepare the following mixture:

No. 2	4 drachms.
No. 3	3 drops.
No. 4	2 drops.

Shake up the mixture well, and then pour it over the plate, and keep the solution in motion. The image ought to appear very soon, and may be developed until the shadows become slightly tinged. The plate is now thoroughly washed with water on both sides, and afterward with a dilute solution of acetic acid, 2 drops of glacial acetic acid to 1 ounce of water.

The picture is afterward intensified by flowing it with the following solution:

No. 3	3 minims.
No. 5	3 minims.
Water	2 drachms.

When the shades are sufficiently dense, the plate is again well washed and immersed in the fixing bath recommended for the wet process. It is finally washed thoroughly and set aside to dry. The author of the process says that a strong solution of the cyanide of potassium is preferable to a weak solution, which has a tendency to cause the film to split up on drying. As before remarked, we should prefer the use of the hyposulphite fixing solution in this process, but have not the experience to assert that it is decidedly better.

And now, dear reader, we have finished the task imposed upon ourselves. It is to be hoped the work will be found useful to you in many-ways, because the instruction communicated is, in general, of a very varied character and the result of successful practice.

In a month or two you will, *Deo volente*, hear again from us; there is no possibility of satisfying our publisher; he is ever crying out, *viva voce* or by letter: "More, more," and as long as we have a laboratory to work in, brains to concoct, and fingers to write, you may expect "more, more," and we hope you may remain in the condition of our publisher, ever craving after fresh food, but never satisfied. *A dios!*

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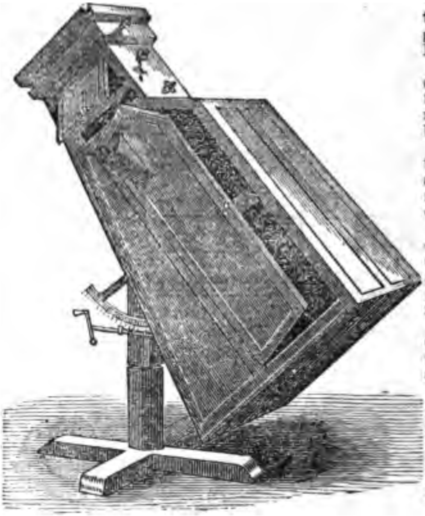

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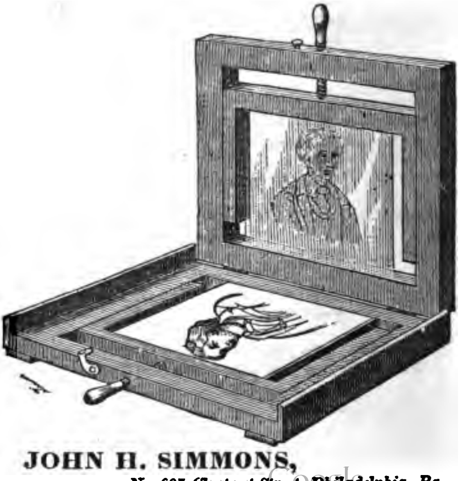

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Negatives can be printed from in a few seconds after having been varnished.

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It never chills if the plate is dry.

It is equally good for positives or negatives.

It gives a beautiful gloss and brilliancy to Ambrotypes and Melainotypes, is as hard as glass, and will not crack or peel.

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Acid, acetic, glacial ....oz.	0 20
“ “ No. 8..............lb.	0 60
“ citric ....oz.	0 12
“ gallic ....oz.	0 60
“ nitric, C. P. ....lb.	0 60
“ muriatic, C. P............lb.	0 50
“ pyrogallic.................oz.	2 50
“ sulphuric, 66° B..........lb.	0 20
“ tannic (tannin)...........oz.	0 50
Alcohol, rectified for collodion...lb.	0 75
Ammonia, conc................lb.	0 60
Bicarbonate of soda............lb.	0 12
Bichromate of potash...........lb.	0 10
Bichloride of mercury ....lb.	0 12
Bisulphate of potash............lb.	0 25
Bromide & iodide of ammonium..oz.	0 85
“ “ cadmium...oz.	1 00
“ “ calcium....oz.	0 75
“ “ lithium ....oz.	4 00
“ “ magnesium.oz.	1 00
“ “ potassium..oz.	0 60
“ “ sodium.....oz.	0 75
“ “ zinc ....oz.	0 60
Bromine.........................oz.	0 75
Chloride of ammonium ....oz.	0 10
“ cadmium............oz.	0 50
“ calcium ....oz.	0 10
“ magnesium..........oz.	0 12
“ strontium...........oz.	0 10
Chloroaurate of calcium, 15 grs. (in gold)	0 50
Chloroplatinate of calcium, 15 grs. (in gold)......................	0 30
Chloroplatinate of mercury, 15 grs. (in gold).......................	$0 20
Collodion (lithium), extra sensitive (for negative)...............lb.	2 25
Collodion (sodium) very sensitive (for negative)................lb.	2 00
Collodio-chloride for opal pictures..	2 00
Cyanide of potassium...........lb.	1 10
Ether rectified for collodion.....lb.	1 75
Gun Cotton, A. I. (French) .....oz.	1 00
Hyposulphite of lime...........lb.	3 00
“ “ gold (sel d'or) 15½ grs........................	1 00
Hyposulphite of soda...........lb.	0 18
Iodine...........................oz.	0 60
Nitrate of ammonium..........lb.	0 80
“ silver.......(in gold) oz.	1 00
“ uranium ....oz.	1 00
“ uranium & ammonia..oz.	1 00
Phosphate of soda..............lb.	0 50
Saccharosulphate of iron........lb.	0 15
Saccharosulphate of iron and ammonia.......................lb.	0 45
Saccharosulphate of iron and potash ....lb.	0 20
Sulphuret of potash............lb.	0 50
Tungstate of soda...............oz.	0 50
Varnish for negative ....lb.	1 60
Varnish for opal picture (white) lb.	1 00
Plain Steinbach paper........ream.	35 00
Albumenized Steinbach paper (silver bath 50 grs. to the oz.) ream.	45 00

P. C. DUCHOCHOIS, Chemist,

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Use the Helion Cotton with great success, and recommend it to others in terms of highest praise.

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Helion Cotton took the prize medal at the late Fair of the American Institute. — Its uniformly good qualities have driven all foreign competition from this continent. — It is the greatest improvement of the age in Photographic art.

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Formula for Collodion.—**Ether and alcohol, equal parts; iodide of amonium, 4½ grains; bromide of cadmium, 2½ grains; helion cotton, No. 1, 8 grains; No. 2, 7 grains; or No. 3, 6 grains to the ounce. Add 3 to 5 drops of strong tincture of iodine to each ounce of collodion as you use it.**

Beware of counterfeits; the genuine has the name of the manufacturer on each ounce package.

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Producing all the effects without the aid of wooden pillars or other heavy rolling stock. Our Operator takes copies from all our new Designs, which we have on hand, as a test before we deliver them. Our

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Our Distemper Grounds—the best that can be made for Photographs—we make, as usual, from our Original Tints, 1, 2, and 3, vignette; 4, 5, and 6, cartes de visite; 7, 8, and 9, for four-fourth. There is only one objection to them—they are easily spoiled and rendered unfit for use by leakage through the skylight, head rest, or any other accidental circumstance, such as grease spots, etc. Our

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In answer to the often-asked question—Can you paint Old Grounds over again? We can, but we do not recommend or think it worth our attention, as the color will crack, and they are not worth the trouble and cost. We leave all that work to tinkers, cobblers, and white-washers.

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TESTIMONIALS.

BOSTON, December 10, 1864.

Mr. A. S. Barber.—Dear sir: Having used your Albumenized Paper for the last six months with entirely satisfactory results, we take pleasure in saying we wish for nothing better.

BLACK & CASE.

BOSTON, May 1, 1865.

I am now using paper albumenized by Mr. A. S. Barber, of Hartford. Conn It gives me excellent satisfaction.

JOHN A. WHIPPLE.

ROCKFORD, ILLS., December 30. 1864.

I wish you to send me one ream of your extra Saxe Albumenized Paper. Please send it at once, as I am almost out, and could not make photographs without Barber's *best*.

G. W. BARNES.

CLEVELAND, OHIO, January 18, 1865.

I have been a practical photographer and dealer in photographic materials for fourteen years, and have never found an Albumenized Paper that has given as good and general satisfaction as A. S. Barber's, of Hartford, Conn.

A. S. ROBBINS, Dealer in Photographic Goods.

PIONEER, OHIO, March 14, 1865.

Allow me to say that it gives the best satisfaction of any paper I ever used. I have just ordered some of Mr. A. S. Robbins.

O. KELSEY.

[From Humphrey's Journal, February 15, 1864.]

We have tried your Albumenized Paper, both Rives and Saxony. The paper carries with it a recommendation that will eventually give you all the work you can do to supply it. We wish you the success you so well deserve.

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E. H. ALLEY, Dealer in Photographic Goods and Practical Photographer.

KEENE, N. H., March 8, 1865.

We have worked various kinds of Albumenized Paper, both American and Imported and we can truly state that the paper of your manufacture gives better satisfaction than any other we have ever used. It is superior in quality and cheaper in price than most others. Therefore, we would cheerfully recommend its use to the photographic fraternity.

FRENCH & SAWYER.

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J. [illegible] PRA

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EAGLE PRINTING BOARD!

(PATENTED.)

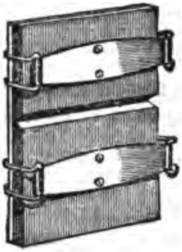

Fig. 1.

Fig. 2.

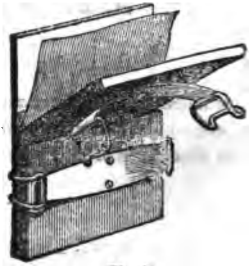

Fig. 3.

The above valuable invention is now ready for sale. Its advantages over the old printing frames, are:

1. **It weighs only *one-quarter* as much as the old-fashioned printing frames.**
2. **It will never break a negative.**
3. **It can be handled in half the time of any other.**
4. **It occupies only one-quarter the bulk of any other, and thus saves expense in packing and freight.**
5. **Twenty-five per cent. more printing can be done with it than with any other, because it can be so much more expeditiously handled.**

THE CUTS.

Fig. 1 shows the back of the boards with the brass springs, and a hook or clamp on the end of each, to hold the negative to the board.

Fig. 2 shows the front view, with a negative as it appears when being printed.

Fig. 3 shows the board partly open, to allow the operator to inspect the print, and see how it is progressing.

TESTIMONIALS.

Prof. Towler says: "It is decidedly a neat invention; so light and yet so strong; so easy of manipulation, and yet so very appropriate in all its parts. I shall use it altogether in my laboratory."

The Editor of *The Philadelphia Photographer* says: "I think it is very neat indeed, and will be sure to be approved of by all Photographers; send me half a dozen of each size."

William Campbell says: "It is all I could desire; so light and so easy of manipulation, and withal so simple, that it must eventually be the only style of Printing-Frame used. I recommend it to all."

Oscar G. Mason says: "They are a capital contrivance, and will be sure to have a great sale. It is astonishing that such a frame was never thought of before."

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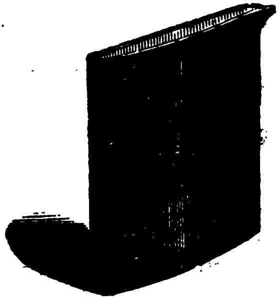

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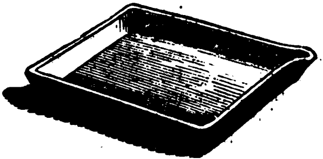

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Why will you spend your money for other ware, which costs so much *more*, and is actually *inferior* in durability, when you can get

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No. 1, 1-4 size	$0 60	No. 1, 5 x 7	$0 45
" 2, 1-2 "	1 00	" 2, 7 x 9	0 65
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" 4. 9 x 11 size	4 00	" 4. 10 x 12	1 35
" 5. 11 x 15 "	7 50	" 5. 12 x 16	3 00

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BY JOHN TOWLER, M. D.,

Professor of Chemistry, Natural Philosophy, and Mathematics in Hobart College; Author of "The Silver Sunbeam," "The American Photographic Almanac," "The Porcelain Picture," "Dry Plate Photography," etc., and Editor of "Humphrey's Journal of Photography."

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"Prof. Towler has placed the whole photographic fraternity under lasting obligations for thus reproducing, for their special benefit, the *whole art and science* of Photography in a convenient and elegant form, and I sincerely thank the enterprising publisher for giving me by far the best, cheapest, and handsomest book on Photography that I have ever seen."

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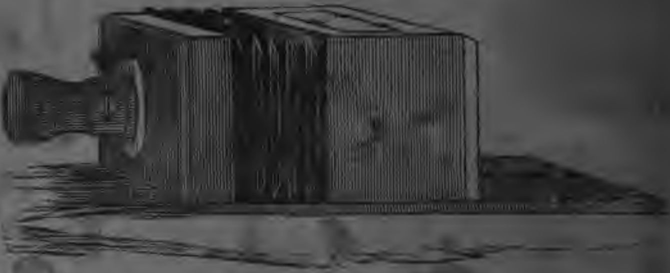

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